Taking the Customer into Partnership,—The Success of a Plan for Cementing Relations with the Local Public through Diversified Ownership of Stock, and other articles on public relations.

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Electrical World

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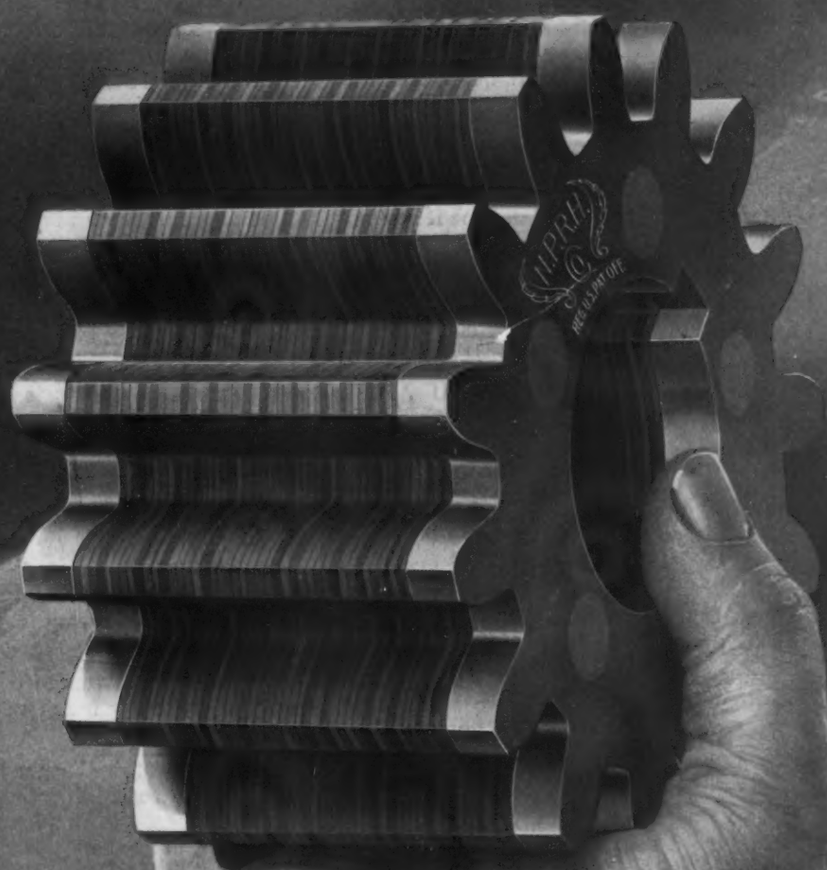
"DO IT NOISELESSLY"



NEW PROCESS PINIONS

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EFFICIENT
DURABLE
STRONG
SAFE

NEW PROCESS GEAR CORPORATION
SYRACUSE, N.Y.

A.E. Michel, Ad

Weston

The Weston Reputation—
A Fact or a Fable?

Prior to 1888 the electrician, the electrical engineer and the scientific man found it practically impossible to make accurate measurements of most of the important electrical quantities with which they were then dealing, because there were no instruments that would accurately and quickly measure the said quantities.

In that year, after years of painstaking research in numerous directions, the Weston Permanent Magnet Moving Coil Instruments were placed on the market. For the first time it became possible to accurately and quickly make such measurements.

At first many of the foremost electricians, electrical engineers and other scientific men were skeptical of the real and permanent value of these Instruments, and many ridiculed the claims made for them, some going so far as to pronounce them valueless.

Gradually, however, the real value of the Instruments began to be recognized; their sale and use in this and foreign countries steadily increased, until it became a recognized fact that these Instruments constituted a contribution of incalculable value to the art of electrical measurement.

Their introduction and use gave an impetus to the development of each of the numerous branches of the electrical industry that was most marked, and that was not before possible.

In fact, these Instruments virtually created the art of practical measurement and provided a new and powerful means of successfully solving many difficult problems.

But these Instruments did more than that, for their effect was to convert electrical engineering into a scientific profession, whereas much of it theretofore had been purely empirical.

During the 28 years since the introduction of the Weston Permanent Magnet Moving Coil Instruments no substitute has been found for them. Wherever electrical energy in the form of direct currents is employed, Weston Instruments of this type, or imitations of them, are used.

In fact, the use of Weston Instruments is world-wide, and they remain pre-eminent in quality and in usefulness today.

The Weston Reputation, therefore, is not a fable—it is an established fact.

Weston reputation, however, does not rest alone upon this particular contribution to the art of electrical measurement, for numerous other equally important contributions to that art have been made by the Weston Company. In subsequent advertisements we shall deal with these other contributions.

Weston D. C. Switchboard Instruments are described in Bulletin No. 20.
Weston D. C. Portable Instruments are described in Bulletin No. 501.
Write us for them.

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Weston Electrical Instrument Co.

Electrical World

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Counting the Cost of Finding Costs

NO sane business man, merchant or manufacturer sends a dollar on the chase of a penny. Over-elaboration of methods of controlling costs, over-organization for the handling of routine, is a waste that is well recognized in private business. It seems increasingly evident that this axiom of sound business management is being overlooked in the regulatory procedure which has come to form a general principle of control of public utilities by commissions. Tremendous sums are being spent either by order of the commission or by the utilities themselves in anticipation of such an order to determine the investment value of the plant. Around this objective are waged expert discussions as to principles and methods of valuation. It is well to check up occasionally, as in any business enterprise, and to consider the results to be obtained and the cost of obtaining them by using present methods. After all, a commission broadly exists to see that the public receives fair play. Fair play generally comes down in the public mind to a question of how the individual pocketbook is affected. Taking this as a basis (there are, of course, many other factors), it ought to be evident even to the public that somebody has got to pay the cost of getting costs, and that as business is organized to-day, whether public or private, it is the public that pays the cost. In the private business increased costs show later in increased prices. In the public business increased costs enter into increased taxes. That very old maxim "penny-wise and pound-foolish" is still applicable to us humans. Let us count the cost of getting costs and see if there is not a more economical way, just alike to the public and the private business.

Compiling Statistics of Foreign Commerce

EDWARD N. HURLEY, vice-chairman of the Federal Trade Commission, is putting before various business organizations of the country certain facts in regard to our trade with European countries and their trade with us. Mr. Hurley speaks with facts and from the viewpoint of the everyday business man. No one listening to him can doubt the sincerity of the Federal Trade Commission in its efforts to be of real aid in the promotion of our foreign commerce. The commission, however, like all government bureaus or commissions, comes under the blanket-suspicion with which the average man in the country regards the activities of government. It is a fact that if any of us receive a blank to be filled out for the government, whether it questions us in regard to our incomes or asks us how many children we have in school or what our capitalization and gross business is, our first step is to ask a lawyer for advice, and the second to tell as little as we may. This feeling arises from the unintelligent, not to say ridiculous, way in which totals from business and facts about business have been interpreted by earlier government commissions and bureaus. Mr. Hurley in his talks has made it very clear, however, that the figures which the trade commission proposes to collect from the 250,000 and odd corporations will be used intelligently for the benefit of the business and commerce of the nation. The commission is about to send a letter to the list of corporations asking for specific information in regard to domestic and foreign trade. The summaries of these statistics will be compiled to indicate in general our relations to the European countries both as buyers and as sellers.

Sending Power Under the Golden Gate

AN interesting recent accomplishment in transmission engineering is the delivery of power in San Francisco by cables laid across the Golden Gate, on the whole the most notable feat in submarine power transmission yet attempted. San Francisco is somewhat unfavorably situated for the reception of power from plants to the northward, lying as it does on the extreme end of a peninsula cut off from the mainland by San Francisco Bay. The great network of transmission lines which serve the central part of California until rather recently has been able to reach San Francisco only by a long detour around the southern end of San Francisco Bay and along the shore into the city. Only the plants to the southward have anything like a direct course. To get from the northward even into Berkeley and Oakland, across the bay, by any straight route involved a somewhat daring but successful aerial crossing of the Carquinez Strait. As the hydroelectric stations to the northward multiplied in number and importance some means of getting at the San Francisco market more directly became altogether desirable, particularly as the San Francisco steam stations could thereby the more readily be made to serve as relays for the rest of the networks. "Co-operative unity in full demanded some way of getting into San Francisco with hydroelectric power other than going around the bay. Quite recently a pair of cables were thrown across from Oakland which were capable of relieving the situation somewhat, but even that route left considerable to be desired in the symmetrical completion of the networks, especially with respect to the more northern hydroelectric resources. The result of this need was the cable crossing described in our present issue.

As a matter of ancient history it is worth noting that

the scheme was first proposed more than twenty years ago in connection with a projected northern development long prior to the upbuilding of the great network now existing. It was considered practicable, though somewhat difficult, even at that early time, and was to be confined to a considerably lower voltage than that now in use. Experience with cable building has now shown that up to medium voltages underground or even under-water cables can be used with entire success, and the mere matter of insulation is not now a problem to deter the engineer from a work like the present. It will be surprising if some trouble does not develop with the cables, but it will also be surprising if it is not successfully overcome.

The great interest of the feat from an engineering standpoint lies in the very skillful and resourceful manner in which the difficult mechanical problems have been handled. In such a work as this the cables must be laid in duplicate, but the delivery of 18,000 hp., even at 11,000 volts, in the cables implies dealing with inconveniently heavy cables with a length of 13,000 ft., necessitating somewhat numerous joints. A scheme for laying the big cable in comparatively short lengths was well worked out by the preliminary laying of a messenger cable holding against the stiff current a cable barge on which the great specially designed reels could be carried, and which also furnished facilities for the thorough making of the necessary joints. This current raises mechanical difficulties both in laying and maintenance upon the whole quite as serious as anything which has to do merely with cable construction from the standpoint of insulation. There is some possibility of trouble, too, from the fact that the cables lie in a rather busy waterway, but anchorage at the point of crossing is forbidden by government regulations, and the depth of the water is so great as to lessen the risk from casually dragging anchors, which would become serious in shallow water. Altogether, it seems to be an extremely workmanlike job which accomplishes a most useful result and reflects great credit on the care and ingenuity of the engineers who have carried it out.

Getting More Houses Wired

ONE of the most important factors, if not the most important one, in promoting a successful "Wire-your-home campaign" is the method of financing new wiring, particularly in the wiring of old residences and the homes of small consumers. In the transaction are involved the customer, the contractor and the central station. The customer will assent more readily to the advantages of electricity if he can pay for the work without too great an initial outlay. The contractor, in his turn, needs the money for the payment of labor and material at once. Nor is the central station primarily interested in advancing the capital for such extensions, although in some instances the local lighting company has taken this responsibility and arranged to pay the contractor for all work on a predetermined scale of prices. There is one concern in the community, however, whose business it is to loan money—the bank. Why should not the local bank, therefore, take over the financing of the plan under some method of discounting the amount of the customer's order? The banker in the average community is the financial adviser of all the business men as well as of many residents. His participation in any plan for financing the wiring of old houses has the added advantage of helping to weld together all the business interests in the town and the central station.

The Patent Office and the Inventor

THOSE who are struggling to obtain protection for inventions should be grateful for the hope of better things which may be brought about by changes likely to come from the recent bill enacted providing for reorganization within the Patent Office. The present situation is unsatisfactory to all concerned. It is a burden to the Patent Office on account of the enormous volume both of patents and of claims encouraged by the present rules of procedure. It is often disappointing to the inventor, who may find that his cherished official document is merely an admission ticket to a colossal litigation with at least three rings, winding up with the United States Circuit Court of Appeals as a final center of awed attention. And it is eminently annoying to the public on account of the excessive amount of litigation, which leaves the honest user of patented appliances in perpetual doubt as to whether he is an accessory to malicious infringement.

The examiners as a whole are competent, intelligent and reasonable. They are not, however, required to make elaborate searches nor to tell importunate attorneys how to draw their claims, and they are seriously overworked because of the burden which is thrown upon them. The attorneys, zealous for the interest of their clients, return to the charge again and again, with more or less inconsequential modifications of their claims, until they get all the concessions possible from the Patent Office. Without the slightest desire to criticise the examiners, one is instinctively reminded of the parable of the judge and the widow whose importunities finally wrung concessions from him. Anyone who has read the "file wrapper and contents" in a group of closely contested cases will realize the nature of the verbal struggle which goes on, winding up often with a set of claims which on their face technically meet the objections of the examiner but which ten years afterward, read in the light of the state of the art then existing, as frequently happens despite injunctions to the contrary, may lead to some very strange decisions. More thorough searching in the Patent Office will undoubtedly help very materially in producing patents of more substantial value, but still greater improvement could be made by so modifying the procedure as to make the claims less indefinite in their terms. The amount of litigation which has hidden behind phrases like "means for" doing this, that or the other, and the use of vague all-embracing adjectives, is something prodigious. Some means of enforcing greater clarity and precision in the drawing of claims is badly needed in

the practice of the Patent Office. The lack of it results in claims which on their face may be much broader than the real invention considered on the facts of the application. The whole situation is one which has gradually grown from bad to worse until it needs effective remedies which we earnestly hope will be administered.

The practice in interference cases also needs attention and a broader treatment than it now receives. At present it sometimes happens that an interference between two inventors ends by the narrowing of both sets of claims, to avoid the imminent issues, to an extent which leaves both patents so restricted that neither has the scope to which the date and character of the invention would have entitled it had the interference been worked out on broader lines. Both the inventor and the public would profit by clearer definition of rights based on the merits of the case, and certainly the overworked and perpetually harassed officials of the Patent Office would welcome the change.

How Gas-Filled Lamps Affect Fixture Design

AT a recent meeting of the Illuminating Engineering Society in London modern illuminants formed the topic of the evening, and during the discussions some extremely important facts regarding the practical use of the gas-filled lamp, popularly known in England as the "half-watt" lamp, came to the front. In particular, the bearing of the new lamp on fixture design was very seriously considered, and some of the conclusions are well worth emphasizing. As a suitable text for the discourse one may well quote a statement made by F. W. Willcox in the discussion, as follows: "We have at last come to a type of incandescent lamp which does not permit being substituted for existing lamps in the old-style fittings and reflectors, as the ordinary tungsten lamp was when it replaced the carbon lamp." Unless this situation is very fully realized, the increasing use of the new lamp will be marked, as already has unhappily been the case, by a good deal of bad lighting. Even in indirect and semi-indirect lighting the fixtures suitable for the older lamps will rarely do good service with the new one, and a great deal of re-designing is going to be necessary before the illuminating engineer finds suitable material at his hand for utilizing incandescents of the latest form.

The difference comes about from the very high intrinsic brilliancy and the extremely compact filament of the gas-filled lamp. Owing to the first-mentioned fact, many shades and globes which have done perfectly good service in their time now let through too much glare and must be discarded. In addition, the extreme concentration of the filament, besides adding to the spotted effect produced in the globe, makes demands even in semi-indirect and indirect fixtures for unusual care in design. The reflecting surfaces must be exactly shaped in order to procure the requisite distribution, and the position of the filament itself with respect to the base of the lamp must be standardized with great precision to avoid unpleasant focusing effects.

Speaking broadly, the advent of these lamps means the general re-design of fixtures and illuminating accessories. A few excellent types have already been evolved. In other cases some of the older standard fixtures can be usefully employed in indirect and semi-indirect lighting, provided that the lamps can be and are carefully centered with respect to the reflecting surfaces. The illuminating engineer may do much in the application of gas-filled lamps to the fittings already manufactured if he will take care to avoid too high intrinsic brilliancy and to select the size of lamp and the fixture suitable under the new conditions. In spite of this there is a crying need for specialized fixtures, which will become all the more acute when the small "half-watt" lamps described by Mr. Willcox, taking even as low as 15 watts, become commoner than they now are. But even with the sizes now common there is continual trouble in securing suitable fixtures for the varied purposes of the illuminating engineer. The shadows cast by the highly concentrated filament are hard and unpleasant, and they are particularly offensive in the case of indirect or semi-indirect bowl fixtures carried by chains or fitted with a brass rim. With all these troubles there are great advantages in the efficiency and excellent color of the new illuminant, and its advent is bringing not only increased illumination but a simplification of installations which is highly desirable. Single lighting units are likely to replace clusters in very large measure, and the whole group of costly and inefficient fixtures which have been handed down as relics of the gas-lighting era are likely to disappear. In their place should come new designs more artistic than ever before because freed of some of the old and inconvenient traditions, efficient even when of material less translucent than can be advantageously used with the older lamps, and adapted to bring illumination into a new harmony with its architectural environment.

The Coming Issues

NEXT week, in the station-operation issue dated March 11, the performance of several small oil-engine generating stations will be the subject of a leading article presenting results of tests and an analysis of the operating conditions under which the various figures were obtained. A practical method of calculating the alternating-current resistance of strap conductors will be one of a number of other articles on operating and engineering problems to appear in the same number. In the third issue of March—the engineering number of the month—a timely article will take up the investigation of errors incidental to the use of the sphere-gap for measurements of high voltage. Opportunities for the young electrical engineer in the telephone field will also be discussed in the same issue by M. C. Rorty of the American Telephone & Telegraph Company. Continuing the usual order, the fourth issue of the month will be the commercial number, followed the next week by the issue especially devoted to questions of public relations —this being the first issue of April.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

Association Formed to Foster Water-Power Development

Offices were opened in Washington on Monday by a new national association which will launch a campaign of publicity designed to aid the administration in securing the passage of laws to encourage the development of water-powers in the public domain and the navigable streams. The new organization, which calls itself the Water-Power Development Association, is composed of manufacturers of waterwheels, hydraulic and electrical machinery, equipment and supplies, whose business has been seriously injured by the stagnation in hydroelectric construction work in the last few years and who look forward to a revival of the industry and an increased business when the general dam act and the leasing bill for the power sites in the public domain, supported by the President and by Cabinet officers, are enacted into law.

In a statement issued by Marcus A. Beeman, secretary of the association, concerning its aims and purposes it is asserted that the country has been greatly misinformed concerning the facts about the water-power industry and the legislative situation, and the new organization intends to carry on a campaign of publicity which will present the facts.

"The purpose of the Water-Power Development Association," Mr. Beeman said in his statement, "is to tell the truth about water-powers and the water-power business. We intend to tell the American people the facts that have been kept from them as to why our water-powers are allowed to flow to waste while we burn coal at high prices to generate power. We mean to expose the crime that has been committed in locking these natural resources from use and keeping them locked from use, and to show the benefits that will accrue to the whole nation from development and use, as well as to make plain what kind of legislation is necessary to induce investment in water-power development.

"There seems to be a unanimity of opinion that legislation of some kind is needed. The President of the United States, Secretary of the Interior Franklin K. Lane, former Secretary of War Lindley M. Garrison, the public-lands committees and the committees on commerce of both the Senate and House have all recommended legislation. The House of Representatives has passed bills to permit use of power sites in both the public domain and the navigable streams. There are some differences of opinion as to the details of this proposed legislation, but we believe that all the persons named are disinterested and sincere in their recommendations and that these differences of opinion are not vital.

"Our association is not committed to any particular bill or any particular plan or program of legislation. It desires only such legislation as will bring development and use of the water-powers and will fully protect both the interests of the public and those of investors in these enterprises."

The affairs of the development association are in the hands of a committee made up of Harry W. Hand, vice-president of the I. P. Morris Company of Philadelphia, waterwheel builder; W. W. Nichols of the Allis-Chalmers Manufacturing Company of Milwaukee, maker of waterwheels and electrical apparatus; Chester W. Larner of the Wellman-Seaver-Morgan Company of Cleveland, waterwheel manufacturer; J. E. Way of R. Thomas & Sons Company of East Liverpool, Ohio, insulator manufacturer, and Calvert W. Townley of the Westinghouse Electric & Manufacturing Company of Pittsburgh, manufacturer of electrical apparatus and supplies. Marcus A. Beeman, secretary of the association, has been assistant secretary of the Cleveland Chamber of Commerce and the Buffalo Chamber of Commerce and secretary of the New Jersey State Chamber of Commerce.

Heating-Device Licensees Announced

The list of manufacturers of electrical heating devices who have been licensed under the Marsh patent, No. 811,859, to continue the use of nickel-chromium wire as a resistance element in electric-heating apparatus has just been made public by the Hoskins Manufacturing Company and the General Electric Company, owners of the patent. The list is as follows: American Electrical Heater Company, Cutler-Hammer Manufacturing Company, Hotpoint Electric Heating Company, Hughes Electric Heating Company, Landers, Frary & Clark, Peluze Manufacturing Company, Simplex Electric Heating Company, and S. Sternau & Company.

The absence, however, of the names of two companies, both of which have been represented at the conferences between the heating-device manufacturers and the owners of the patent, is perhaps significant. What action is being contemplated by these companies it was not possible to ascertain, but it is known that one of them is by no means abating its efforts in the sale of its household-heating appliances.

While it was at first decided to collect royalties on deliveries taking place after Feb. 15, and while the licensing goes into effect at once, in all probability, since many of those non-licensed had orders booked for delivery at their prices away into the future, the owners of the patent will take no definite action further than the granting of the licenses until the fall, after which, it is expected, there will be a revision in prices of heating appliances using a nickel-chromium resistance element. That the revision in prices will undoubtedly be upward is indicated by a recent upward revision by two of the larger manufacturers of these appliances

In announcing the names of the licensees the owners of the patent state that they do not intend "to proceed against any dealer, jobber or central station with respect to resale of infringing devices in the past, provided that such dealer, jobber or central station in the future purchases devices embodying the inventions of these patents made by the Hoskins company, the General Electric Company or their licensees authorized to make such devices, and does not purchase or deal in infringing devices except to dispose of reasonable stocks now on hand."

The Driver-Harris Wire Company, manufacturer of nichrome wire, a nickel-chromium wire used largely by heating-device manufacturers, stated that it was still in conference with the owners of the patent, and that so

far no final decision had been made regarding which manufacturers of nickel-chromium wire should be licensed.

An abstract of the decision of the Court of Appeals of the Seventh Circuit (224 Fed. 424) sustaining the action brought by the Hoskins company against the General Electric Company for infringement of the patent was published in the ELECTRICAL WORLD for Jan. 8, 1916. It was as a result of this decision that the General Electric Company, in order to protect itself and its customers, acquired a third interest in the patent.

Commonwealth Edison Revenue More Than $20,000,000 in 1915

The gross revenue of the Commonwealth Edison Company of Chicago, Ill., for 1915 was $20,882,327, which is an increase of $1,822,131 over the fiscal year ended Dec. 31, 1914.

During the year 1915 the company issued $8,000,000 of its first-mortgage gold bonds, in part to reimburse the treasury for net income expended for property prior to Dec. 1, 1914, and in part for the acquisition after that date of additional property and facilities to take care of the general expansion of the company's business. The $7,000,000 of one-year notes issued in 1914 were paid.

Approximately 26,863 customers were added to the company's circuits during the year, which continued growth makes it necessary for the company to install during 1916 important additions to its generating plants and distribution system.

The old generating station known as the Harrison Street Station, at Harrison Street and Chicago River, which was erected in 1893 and for a period of ten years was the company's principal generating station, was sold to the Chicago & Alton Railroad for $1,300,000. With the constant developments in the production and distribution of electricity, this station, regarded as one of the best in existence when it was constructed, became obsolete, and for some years it had been used only as a substation and to assist occasionally in taking care of the heaviest winter loads. It will be entirely dismantled in the course of a few months.

All the offices of the company have now been moved to the New Edison Building, and at the present time approximately one-half of the space in this building is used for such offices and for other company purposes, leaving ample space for future growth. The "Edison Shop" is on the main floor, and excellent opportunity is afforded there for the display and sale of devices consuming electric energy. The business thus far done by this shop has fully met expectations—both directly in the extent of the sales made and indirectly in the increased consumption of electricity resulting from the use of such devices on the company's system.

Through the medium of the employees' savings fund, 529 employees have become stockholders in the company, and the number of additional employees who are in the process of becoming stockholders through this fund is 1567. Thus a total of 2186 employees either now are or will by July 1, 1919, become stockholders of the company. The company's connected business (exclusive of electrical energy supplied to other public-service corporations) amounted to the equivalent of 12,244,115 50-watt lamps on Dec. 31, 1915.

Attention is called to the accompanying earnings statement, where it is shown that some 7 per cent, or $1,582,039, was paid out for taxes and municipal compensation for 1915. This is significant when it is further noticed that it is but $300,000 less than the company's annual interest charges and is more than $600,000 greater than the balance carried to surplus from the year's operations. In fact, the taxes are 20 per cent of the profits to the company from operation and but little less than half the amount of dividends paid to stockholders.

Attention is also called to the appropriation for amortization and depreciation reserve, which is over 10 per cent of the gross revenue. Operating expenses amounted to 50 per cent of the operating revenue. The earnings and expenses for the year were as follows:

Operating revenue		$20,882,327
Operating expenses	$10,457,345	
Appropriated for amortization and depreciation reserve	2,442,078	
		12,899,423
Net operating revenue		$7,982,904
Taxes and municipal compensation		1,582,039
Operating income		$6,400,865
Other income		118,598
Total income		$6,519,463
Less interest on bonds		1,890,000
Available for dividends		$4,629,463
Dividends paid		3,667,110
Balance carried to surplus		$962,353

Water Power Commission Probable

Federal Government May Resort to Such a Measure as Only Solution to Problems Confronting Congress

Members of the Cabinet of President Wilson, as well as Senators and some Representatives, who are sincerely interested in a possible solution of the difficulties attending the water-power discussions now going on in Congress believe that a proposal which has been made for a waterways commission will solve many problems if it be carried out.

A plan for such a waterways commission has been proposed to the President. All features of river and inland waterway regulation would be placed in the commission's hands. This, it is specifically stated, would include all plans for hydroelectric power development.

The Washington correspondent of the ELECTRICAL WORLD predicts that none of the water-power bills now pending in Congress will be passed at this session of Congress because of the tactical situation which confronts all of the appropriation bills and the necessity for Congress to agree upon a revenue-producing measure. No appropriation bills have been passed and no agreement has been reached as to a revenue bill to make up the deficit in the public moneys. It is reported that Congress cannot do the work remaining to be done between now and the intended early adjournment in June, so far as expenditures of public money and raising revenue are concerned.

In these circumstances it is believed that Congress will turn with hearty support, on both sides of the political field, to the proposition which has been advanced that there shall be created a waterways commission with power to recommend to Congress what shall be done as to water-power developments.

Informal discussion in Washington has turned upon the possible personality of such a commission. Senators who have been consulted are cautious in expressing views. Members of the House of Representatives who have bills of their own in regard to water-power matters which they optimistically think will be "jammed" through do not greet the idea of a commission with open arms. But a conference has been held between a committee of Senators and Cabinet officers, including men who represent all points of view, and it is possible

that an agreement may be reached whereby the President will send a special message to Congress on the subject.

The dreary debate which has been going on in Congress takes in no new points. The arguments which have been presented over and over again at last year's sessions and those of the year before bring out few new facts except such as the industries have developed. Congress and the Cabinet know nothing new on the subject, and it is understood that the President would welcome a solution such as that which the creation of a commission might furnish. This, it is reported from Washington, would be in accordance with the traditions of Congress. Whenever there has been utter and long-continued disagreement upon a question of public policy it has been found in Washington to be serviceable to appoint or create a commission either of investigation or with power to act, and it seems certain that that is to be the outcome of the water-power bills. Senator Husting of Wisconsin, who has been particularly active in offering amendments to the Shields bill, which is a substitute for another bill, intends now himself to offer an entirely new substitute for the substitute. There is similar activity on the House side. There are more substitutes for substitutes being offered on both the Senate and the House side in regard to water-power matters than Congress has seen for years. New so-called conservation organizations and so-called anti-conservation organizations are coming into play every once in a while in Washington. The debate as to the respective merits of the different bills, not only in Congress but in the various organizations which have to do with water-power matters, has grown in Washington into a confusion of voices suggesting a bedlam.

Muscle Shoals Development

The advantages of the Muscle Shoals power project in the Tennessee River as a site for government powder manufacture in time of need were set before the House committee on military affairs by Major Harry Burgess, army engineer in the Nashville district. He told of the general superiority of the Muscle Shoals water-power and said there could be easily installed there 125,000 minimum horsepower to meet all probable ordnance demands for fixation of nitrogen from the air, and that it would be easy to safeguard all such demands by providing that this amount of horsepower can be raised up to 300,000.

Chairman Hay of the House military affairs committee has inserted a clause in the army reorganization bill providing for the development of the Muscle Shoals power project at the government's expense. The amendment was placed in the bill at the request of Senator Underwood of Alabama. It was submitted to the whole military committee on Wednesday. Under the terms of the Hay amendment, the government is authorized to expend $20,000,000 in erecting a dam and power house "at some place to be selected by a board of three officers of the army to be designated by the President."

Pinchot Repudiated

In debate on his water-power bill on Monday Senator Shields of Tennessee criticised Gifford Pinchot, whom he described as a "discharged subordinate official of the Department of Agriculture seeking to continue himself in the limelight."

Senator Norris of Nebraska defended Mr. Pinchot, and had read to the Senate Mr. Pinchot's recent letter to President Wilson in which he said that the passage of the Shields bill would be a "public misfortune."

Senator Jones also read into the record a repudiation of Gifford Pinchot by the chairman of the executive committee of the National Conservation Congress. Commenting on Mr. Pinchot's open letter to the President against the Shields bill, in which he claimed to represent the conservation movement, including the National Conservation Congress, G. E. Condra, the chairman of the executive committee of the latter organization, said in his letter to Senator Jones:

"As chairman of the executive committee of the National Conservation Congress, I do not know of a time when we have authorized any member of our committee to write the President of our country or to write anyone else concerning the attitude which we assume, or should assume, in legislative matters. We are actively engaged in the practical affairs of conservation, having in view the fullest development of resources, with the minimum of wastage.

"Of course, you know that there are many departments of conservation and that the individual who develops his own interests to the fullest extent is practicing personal conservation. In national conservation we develop the resources for the largest public good.

"There are a number of conservation organizations, both state and national. The National Association of Conservation Commissioners in an organization of men connected with state departments, engaged in work relating to state development.

"The conservation association of which Mr. Pinchot is president seems to exist for the purpose of watching legislation. Just how far Mr. Pinchot has succeeded in this, and just who are members of his association, I am not in a position to state.

"The National Conservation Congress is the largest organization of the kind in the country. Its membership includes many men of federal, state and educational departments and representatives of the leading industries of our country. It is an open forum for the discussion of conservation problems. Its purpose is to gather accurate information concerning resources and industries and to make such recommendations for their development as will conserve national strength and efficiency. There are a number of committees in this congress, each composed of men or of men and women having technical and practical knowledge. The committees prepare and present reports to the congress for open discussion. The resolutions following the reports are either passed or rejected. The results of these deliberations are printed.

"The congress, as such, does not in any way assume either to further or to dictate in legislative matters. This more properly belongs to the legislative departments.

"We have held a meeting of the executive committee of the National Conservation Congress in Washington this week. Without opposition, the subject 'conservation of national strength and efficiency' was decided upon for the next session of the congress, which is to be held here May 2, 3 and 4. It is our purpose to enlist the service of technical thought in reports which will be brought before the session. Each principal material resource is being investigated by a competent committee. More than 300 persons are working on the various committees."

Tenney Interests Developing in Eastern Massachusetts

The central-station interests identified with C. H. Tenney & Company of Boston, Mass., have organized the Eastern Massachusetts Electric Company for the purpose of effecting a more active inter-station development between the Tenney properties at Malden, Revere and Salem. A steel-tower tie line is shortly to be built between Malden and Salem, which will result in all three

of these generating plants being in a position to interchange electrical energy as load requirements dictate. It is also contemplated to develop further the tidewater plant of the Salem company, as the growing demands of the loads of these central stations north of Boston require this expansion. C. H. Tenney is president and D. Edgar Manson is vice-president of the new company, which has received a certificate of incorporation from the State. The capitalization is $250,000.

New 50,000-Kw. Plant for Cincinnati

To Create $15,000,000 Bond Issue, of Which $4,000,000 Will Be Immediately Issued and $3,750,000 Reserved for Plant

A meeting of the stockholders of the Cincinnati Gas & Electric Company has been called for March 27 to approve plans for financing the proposed new central-station plant and certain modifications of the agreements between this company and the Union Gas & Electric Company regarding depreciation, improvements and extensions, the guarantee fund and the natural-gas contract.

It is proposed to construct on the site of the West End works a modern generating plant with an initial rating of 50,000 kw. and ample space for enlargement, equipped with the latest and most efficient type of steam turbo-generators, which, it is expected, will enable the company to compete successfully for the power business of the many large manufacturing plants in the city. This business has hitherto been beyond the reach of the company because of the lack of modern and highly efficient equipment. The matter of furnishing energy for the operation of the Cincinnati street railway has been broached to the railway officials, but this is as far as the matter has gone at present. Construction work will be started in the early spring as soon after the approval of the stockholders is received as possible.

The possible output of the present plant has about been reached, and with the rapid growth of the electric business a substantial increase in the generating equipment of the company is necessary. The present lease from the State of Ohio permitting the use of water from the canal for the Plum Street plant will expire in 1918, and as a renewal of this lease is impossible, owing to the purchase of the canal by the city and the intended use of its bed for rapid transit and boulevard purposes, it has become essential that a new plant be constructed promptly and where condensing water will be permanently available in ample quantities. This is possible in Cincinnati only on the Ohio River.

For this reason the location will be on the company's property at the foot of Rose Street, 89 ft. above low water in the Ohio River and 17 ft. above the highest water that has even been known. In this location the plant will always have plenty of water and will not be compelled to depend upon canal leases, as in the past. The plan provides that the present plant at Plum and Canal Streets shall be used as a substation.

The initial cost of the new station will be $4,000,000, with provisions made to increase the output of the plant to 100,000 kw. at an additional cost of $3,500,000, making the cost of the station when completed, which it is said will not be for some years, $7,500,000. The plans for the new station were made by Sargent & Lundy of Chicago.

The new plant will be owned absolutely by the Cincinnati Gas & Electric Company and leased to the Union Gas & Electric Company. This step is taken so that in event of the cancellation of the lease or any other situation rendering it necessary to resume the active management of the property the Cincinnati Gas & Electric Company would have an electric plant thoroughly modern and complete in every respect.

Stockholders will also be asked to authorize a bond issue of $15,000,000, the bonds to be 5 per cent forty-year sinking-fund gold securities upon which the interest is to be paid by the Union Gas & Electric Company. Of the total, $4,000,000 of the bonds are to be issued at once, and an agreement has been reached by which A. B. Leach & Company of New York will purchase the entire amount at 95. The proceeds will be applied to the construction of the new plant, while $3,500,000 additional will be reserved unissued for additions to the plant as needed. The plan also provides for reserving $1,500,000 to refund a like amount of Cincinnati Edison Company bonds maturing June 1, 1917; $3,000,000 to be held in the treasury to protect the Cincinnati Gas & Electric Company's guarantee of a like amount of bonds of the Cincinnati Gas Transportation Company, and $3,000,000 to pay for improvements already made to the extent of about $400,000, with the remainder for extensions and improvements in various ways from time to time.

Instead of issuing additional capital, as in the past, the financing of the needs of the Cincinnati Gas Company will be from the limited bond issue. The requirements of the company are estimated at from $100,000 to $500,000 annually.

In addition to its present requirements, the Union Gas & Electric Company has agreed to create a special depreciation fund to be 1 per cent but not less than $50,000 annually for the first two years, and 2 per cent thereafter, but not less than $100,000 annually. This money is to be used for reinvestment in equipment and property which passes to the ownership of the Cincinnati Gas & Electric Company. The Cincinnati company is also to secure an interest in the natural-gas lease between the Union Gas & Electric Company and the Columbia Gas & Electric Company, assignable at any time, with an extension of the contract, which expires in 1931, for twenty-five years. The plan further contemplates the substitution of cash in the guarantee fund for bonds of the Union Gas & Electric Company. The Union Gas & Electric Company is to continue the payment of 5 per cent dividends on the outstanding stock of the Cincinnati Gas & Electric Company. The substitution will be made gradually, and the guarantee fund will eventually be increased from $3,000,000 to $3,750,000. The Cincinnati company will invest the cash in government or municipal bonds, thus making the fund more permanent and stable.

The Union Gas & Electric Company may purchase the Cincinnati Gas & Electric Company at any time within five years by paying the par value of the outstanding stock, and after five years by paying at the rate of 115.

New England "Question-Box" Convention

Plans are complete for the spring "question-box" convention of the New England Section, N. E. L. A., which will be held at the American House, Boston, Mass., March 7 and 8. The convention will open at 10.30 a. m., the first session covering new-business questions, and including lighting, power, electric-vehicle and electric-range topics. The forenoon session on the second day will be devoted to production and distribution problems, including such questions as combining plant capacities, reaching outlying territory, the duplication of lines, joint maintenance construction, voltage regulation, fusing of transformers, electrolysis and underground construction. The final session, in the afternoon, will be devoted to accounting problems, and

an informal dinner will be held at the hotel on the evening of March 7. A large attendance is anticipated in view of the great success of the first convention of this kind, which the New England Section held a year ago at the same place.

Mechanical and Illuminating Engineers to Discuss Factory-Lighting Code

A joint meeting of the Illuminating Engineering Society and the American Society of Mechanical Engineers will be held on March 14 at the Engineering Societies Building, New York City, when the subject of a new code for factory lighting will be discussed. A committee of the Illuminating Engineering Society has prepared a code for factory lighting, intended to be used by factory owners to improve their lighting conditions and by legislative bodies to serve as a basis for legislation which shall prescribe minimum values for different kinds of factory lighting.

As this subject is also of importance to the mechanical engineers, the meeting has been arranged to discuss the subject from the standpoint of the two societies. C. E. Clewell, chairman of the committee that drafted the code, will give an outline of the preliminary work leading up to the formation of the code, the necessity for it, and a brief outline of its main points. L. P. Alford will discuss the subject, bringing out those points that seem most important from the mechanical-engineering standpoint. Aside from these two speakers, other prominent members of legislative bodies, representatives of labor and those interested in factory operation will be present to add their discussions.

The object of the meeting is to get as wide a diversity of opinion as possible so as to make the code valuable from a practical standpoint. Both societies are very anxious that all interested in the subject should attend and give them the benefit of their experience in this matter.

Technical and Non-Technical Essential Factors in the Training of the Engineer

The Carnegie Foundation for the Advancement of Teaching, New York City, has addressed a letter to the members of the national engineering societies asking for an expression of individual opinion in listing in the order of their importance the qualities desirable in young engineers. The essential factors named in the letters received in an earlier canvass by the same committee, says the letter, fall naturally into the following six groups, which are here set down in the order of their importance as determined by their frequency of occurrence in the replies:

1. Character, integrity, responsibility, resourcefulness, initiative.
2. Judgment, common sense, scientific attitude, perspective.
3. Efficiency, thoroughness, accuracy, industry.
4. Understanding of men, executive ability.
5. Knowledge of the fundamentals of engineering science.
6. Technique of practice and of business.

"If this is a correct definition of the essential characteristics of an engineer," continues the letter, "it furnishes the necessary basis for a rational discussion of the effectiveness of the schools. It can also be used as a standard in developing staff organizations and curricula and in selecting efficient methods of instruction. The best way in which engineers can aid the schools in solving problems in connection with engineering education is by defining the product which they desire."

The communication is signed by C. R. Mann of the Carnegie Foundation for the Advancement of Teaching, 576 Fifth Avenue, New York. The representatives of the American Institute of Electrical Engineers in the joint committee of the engineering societies are Prof. Charles F. Scott and Dr. Samuel Sheldon.

A. S. M. E. Report on Rules for Power-Plant Tests

The report of the power-test committee of the American Society of Mechanical Engineers on rules for conducting performance tests of power-plant apparatus has been submitted to the executive body, and it has been accepted. It is now in the hands of the printer, and it is expected that it will be ready for distribution shortly.

As presented it embraces performance tests on boilers, reciprocating steam engines, steam turbines, pumping machinery, compressors, blowers and fans, complete steam-power plants, locomotives, gas producers, gas and oil engines, and waterwheels. There are three sections to the report, the first covering instructions regarding tests in general, standards relating to capacity, efficiency and economy, and rules for sampling and drying coal and ash and sampling steam and gases. The second section deals with the ten individual codes, and the third section, which completes the report, contains some thirty-eight appendixes.

This report, which has been under consideration for some time, received its impetus on April 13, 1909, when the power-test committee was appointed under the council's resolution to "revise the present standing code of the society relating to boilers, pumping engines, locomotives, steam engines in general, internal-combustion engines and apparatus and fuels therefor, and to extend these codes as applied to such power-generating apparatus as the present codes do not cover, including water-power, bringing them into harmony with each other and with the best practice of the day." The report was originally submitted on Nov. 15, 1913, and again in December, 1914, each time being revised. The present report is the final revision and embraces suggestions received from a number of engineers and committees of the society, reports from the standards committee of the American Institute of Electrical Engineers, the Bureau of Mines and others interested in this subject.

Concord, Mass., May Abandon Municipal Plant

At the annual town meeting to be held March 6 the citizens of Concord, Mass., will vote upon the establishment of a committee of seven to consider a proposition of the Edison Electric Illuminating Company of Boston for the purchase of electrical energy by the municipality and the closing of the present local lighting plant. The Edison company has made an offer to furnish electricity to the town from the Lexington substation through duplicate underground lines, and it is estimated that the town will save $1,500 per year compared with present costs if Edison service is accepted. The present cost of station operation is $20,863 per year, the estimated cost with Edison service being $19,312. Under the latter a rate of 1.94 cents per kilowatt-hour would be obtained by the town, and the total yearly energy consumption would be about 930,000 kw.-hr. A new electrically driven sewage pump requiring 48,900 kw.-hr. for the year will be installed, and there is also a water-pumping load calling for 56,000 kw.-hr. per year, high service. The present steam generating apparatus of the town plant would be sold under the new arrangement.

Military Training in Educational Institutions Advocated

The members of the five national engineering societies have been addressed by a committee, of which B. J. Arnold, J. J. Carty, R. D. Mershon, M. I. Pupin, L. B. Stillwell and W. J. Wilgus are members, soliciting support of bills providing for the extension of military training in civil educational institutions. The plan proposed in the bills does not conflict with other legislation for preparedness, but will fit in and supplement any of the plans so far proposed for the training of officers. The bills provide that the federal government shall avail itself to a greater extent than at present of the possibilities offered in land-grant colleges and other civil educational institutions now giving military training, or which may give military training in the future, for the education of men competent to take up the duties of officers in case of war.

There are many universities, colleges and other educational institutions in the United States where, in addition to education along other lines, a greater or less amount of military training is given. The universities giving military training are mainly the so-called "land-grant colleges," i.e., universities benefiting under the Morrill act of 1862 (and amendments). The schools other than land-grant colleges are, most of them, private institutions.

The points covered by the bills are briefly as follows:

(1) That the President of the United States shall have authority to establish and maintain in civil educational institutions a reserve officers' training corps which shall consist of a senior division and a junior division. The senior division can be established only in institutions which require four years of collegiate study for a degree and which will comply with the conditions laid down in the bill. The junior division may be established in all other educational institutions which will comply with the specified requirements.

(2) The work of the senior division requires the devotion to it of an average of at least five hours per week during two academic years. The men undergoing this training will be supplied by the government with their uniforms and will have their expenses paid to and from and at the summer training camps to be established as a part of the training. A selected number of those who have completed the work of the senior division may take advanced training. This advanced training contemplates the devotion of an average of at least five hours per week for two additional academic years. The men taking it will have from the government, in addition to their uniforms and expenses in connection with training camps, a monthly payment equivalent to the cost of the army ration.

The work of the junior division requires the devotion to it of an average of at least three hours per week per academic year. The men undergoing this training will be supplied by the government with their uniforms and will have their expenses to and from and at the summer training camps to be established as a part of the training.

(3) That the President of the United States is authorized to detail such number of army officers, such number of non-commissioned officers and such number of enlisted men as may be necessary in connection with the military education and training of the members of the reserve officers' training corps.

(4) That the Secretary of War shall have the authority to prescribe standard courses of theoretical and practical military training for the units of the reserve officers' training corps, and to establish camps in which further practical instruction of the members of the training corps shall be given.

(5) That the President shall have authority to appoint as a reserve officer any one who volunteers for such appointment who has taken the training of the senior division and has otherwise fulfilled the requirements laid down, and that the President may appoint as a temporary second lieutenant in the regular army any reserve officer appointed under the provisions of the bill.

Doherty Electric Plants Increase Equipment

The central-station equipment in the electric plants operated by Henry L. Doherty & Company is being increased very materially, a total of 41,000 kw. being in course of actual construction or manufacture.

The Empire District Electric Company, Joplin, Mo., is proceeding as rapidly as weather conditions will permit with the extension of the turbine room designed to accommodate 30,000 kw., of which 10,000 kw. is to be in operation in May. The Massillon (Ohio) Electric & Gas Company is building an installation of 4000 kw. to be ready for operation in April. The Elyria and Lorain (Ohio) electric properties are putting the finishing touches to a 4000-kw. unit. The United Water, Gas & Electric Company is pushing the extension of its turbine at Hutchinson, Kan., to accommodate an ultimate equipment of 10,000 kw., of which 4000 kw. is practically ready for shipment by the manufacturers and should be in operation by early summer. The Salina (Kan.) Light, Power & Gas Company is being extended to take care of 6000 kw. additional, 1500 kw. of which is to be in operation this summer.

The Alliance (Ohio) Gas & Power Company is installing 2000 kw. in space prepared for it when the new turbine room was built in 1913. The Lincoln (Neb.) Gas & Electric Light Company is building a new switchboard, and the space occupied by the old board is to be used to accommodate a 2500-kw. turbine, which will be in operation next fall. The Athens (Ga.) Railway & Electric Company is preparing to install a 3000-kw. turbine in its steam standby station, to be in operation in September. The Toledo (Ohio) Railways & Light Company is preparing for a 10,000-kw., sixty-cycle turbine or an equivalent equipment in conversion apparatus, depending on deliveries.

Stevens Institute Prepares for Enlargement

Stevens Institute of Technology, Hoboken, N. J., recently purchased a block of ground comprising about two acres, lying directly east of the main building. This purchase, together with the purchase of seven acres last fall from the private grounds of the Stevens estate, gives to the institute all of the land north of Fifth Street to the Castle and permits of future building to the best advantage, both as to general appearance and convenience. It marks the consummation of plans laid by President Alexander C. Humphreys some years ago for the acquisition of such available land in the immediate vicinity of the college as might be necessary for future development. The college now possesses a total of about twenty-three acres lying on rising ground in the city of Hoboken, N. J., with the Stevens Castle at the crest. It has a frontage of 1600 ft. on the bluff overlooking the Hudson River.

During the past two years the institute has had a rapid growth, the number of entering students having been the largest in the history of the college and double that of the years immediately preceding. If the entering classes continue to be as large the next two years, it will be necessary to make early provision for new buildings on the new ground just purchased.

Talks in the Industry

"It is the joint duty of the better element of the public, the regulating commissions and the utilities to try to develop some plan that will avoid periodic disturbances of public relations and at the same time provide for a fair return on, and for the preservation of, the utility capital."—*James D. Mortimer.*

By Frederic Nicholas

If regulation can be made ideal in practice, it is a satisfactory method for the settlement of differences between the public and the utilities. But the practice of several years has revealed weaknesses in the system which of necessity will either be eliminated in time or will lead to the destruction of the policy of regulation. Looking to the possibilities of the future, the suggestion of a "mutualization" of part of the income of the properties is advanced. After an agreed return, such a "mutualization" would mean a division of profits between the corporation, the consumers, the employees and the municipality. It would also include extra compensation for admittted superiority and efficiency in management.

James D. Mortimer, who has discussed these questions with the representative of the Electrical World, *is the president of the North American Company, the Milwaukee Electric Railway & Light Company, the Union Electric Light & Power Company of St. Louis and other corporations, and has been a close student of problems in regulation.*

MR. MORTIMER believes that the success of regulation has not been so conspicuous as firmly to establish this system in our government. "The early state commissions," he said, "put forth earnest efforts to make the laws effective and to wield conservatively the broad powers which are given to them by statute. The undeveloped principles of rate-making, the valuation of utility capital and considerations as to a reasonable rate of return left a wide field for various combinations of law, economic theory and judgment. The dicta of the United States Supreme Court have not helped a great deal in fixing the principles of reasonable regulation, because they dealt with the confiscatory aspects of the subject rather than with its reasonableness.

Economic Experiments with Other People's Money

"No two commissions, starting with the same set of facts and pursuing their varied lines of reasoning, will arrive at the same valuation of a given utility and order the same schedules of rates in a rate case. It is even doubtful if two commissioners working independently on the same commission would arrive at identical conclusions. Regulation has afforded a remarkable field for economic experiments with other people's money.

"Some commissions have been free from the influence of local politics, others have evidently suited their actions to what they believed would please the local community. When a commission has attempted to disregard local politics, it frequently has been attacked and the accusation has been made that the commission is favoring the corporations. Where a commission is influenced by politics the corporation is confronted with the necessity of deciding whether it shall stand idly by or shall return to an acquaintance with political leaders."

Public Gained More Than Corporations

As to the benefits of regulation, the conclusion of Mr. Mortimer is that, on the whole, the public has gained much more than the public-utility corporations. "It is probably true," he said, "that the public has not obtained so much benefit as the radical element among it had originally anticipated or promised, but this is not a valid indictment of the policy of regulation. Corporations have improved somewhat in stability, but, generally speaking, their gains from regulation have been very small. The elimination of the influence of local politics was much desired by corporation managers, but this has not been entirely accomplished."

In speaking of existing methods Mr. Mortimer expressed the opinion that the principles and practices of regulating commissions require standardization. "It is doubtful if such standardization will be accomplished for intrastate utilities until some time after state commissions have come into substantial agreement with the Interstate Commerce Commission on the fundamental principles of regulation of intrastate railroads," he added. "In the interval which will precede this many political changes can take place. The pressure for home rule, for instance, is quite constant, and it is growing in intensity. The whole scheme of control, even of the ownership of public utilities, may be changed.

Regulation Far from Scientific

"As it is practiced, regulation seems to be far from scientific. Conclusions are reached which are based on results that have occurred in the past. Sometimes with modification, sometimes without modification, these conclusions are applied to results that are to be obtained in the future. The issuing of reasonable orders requires that commissions shall prophesy as to what the future will bring forth. The passage from the realm of fact into that of conjecture is fraught with considerable difficulty, and errors of judgment are likely to be very frequent.

"Successful regulation should be, if possible, an automatic process. The periodic regulation of a utility is as likely as not to result in inconsistencies and considerable disturbance of revenues and income. When a case of regulation arises, public relations are always disturbed. For a while certain classes of utilities may avoid important rate cases by making adjustments in rate schedules from time to time, but it is not improbable that sooner or later the limit will be reached and even passed, as it has in the electric-railway business.

Avoid Disturbances and Preserve Capital

"It is the joint duty of the better element of the public, the regulating commissions and the utilities to try to develop some plan that will avoid these periodic disturbances of public relations and at the same time provide for a fair return on, and for the preservation of, the utility capital. If private capital is to continue to flow into public utility investments with the prospects of only moderate returns, more satisfactory assurances of the certainty of the return and of the protection of the investment are required. Without an extended study it is difficult to suggest just what form this protection should take. The added reward for the more efficient proprietors should evidently be a part of any complete scheme. Regulation as it is practiced makes no adequate recognition of efficiency in management."

Mr. Mortimer then discussed the suggestion for a partial "mutualization." Some observers of regulation are inclined to believe that the relations between the utility corporation, the municipality, the patrons or customers and the employees should take the form of a partial mutualization of income. Under such a sug-

gestion the possible plans are numerous, and the form that will best suit a given set of conditions would probably have to be designed to accord with the particular circumstances of the individual case.

"MUTUALIZATION" OF INCOME

"The problems of mutualization of income," said Mr. Mortimer, "are becoming more complicated on account of the geographical extension of utilities which pass beyond the confines of a given municipality and cover a portion of a state or even enter into several states. As a rule, the geographical extension of such utilities is advantageous to all of the public for economic reasons that are well understood in the industry, but it would create a special problem in the adoption of a plan of mutualization.

"Boston and London sliding-scale gas rates, efficiency and profit-sharing systems of wages, so-called scientific management, distribution of securities among customers, employee-investors and municipal profit-sharing are merely subdivisions of the general plan of mutualization of income.

"The suggestion strikes one as being sufficiently interesting to warrant investigation. If experiment with the elements should suggest the success of the whole, we may be able to overcome without damage some of the principal difficulties that now threaten to interfere with the utility business."

Fort Wayne Company Offers to Take Over Municipal Lighting Plant

The Fort Wayne & Northern Indiana Traction Company, through its general manager, S. W. Greenland, has just made a proposal to the city of Fort Wayne, Ind., for furnishing energy for the operation of the city's arc lamps which will mean a considerable saving over present costs without decrease in service. The municipality owns and operates a station which furnishes energy for the street-lighting system as well as for commercial and residential purposes. In 1909 the Council fixed the amount to be paid by the city to the municipal lighting plant at $53 a year per arc lamp.

According to the books of the municipal light department, the arc-lamp consumption for the year 1915 was 963,220 kw.-hr., metered at the power station. There were operated 663 suspended-type arc lamps at $53 per year and 189 ornamental-type arc lamps at $56 a year, which amounts to $45,817, or 0.0476 cent per kilowatt-hour, while at the same time the department supplied some small consumers using less than 400 kw.-hr. per month, or 4800 kw.-hr. a year, metered at the place of consumption, at the rate of 0.0277 cent per kilowatt-hour. It is contended by the private lighting company that if the line and transformer losses resulting in the transformation and transmission of the electrical energy supplied for public lighting metered at the power station were taken into consideration the charge to these small consumers would be found to be less than one-half the charge for public lighting to taxpayers, whose money built the municipal plant and pays for the public lighting. The company therefore submitted the following proposals:

"First—We will furnish electrical energy at our power station on Spy Run Avenue necessary for the operation of the following lamps now in service: 670 4-amp. magnetite-arc lamps, suspended type, to be burned on what is known as the Philadelphia moonlight schedule, being a total of 2000 hours per year, and 189 4-amp. magnetite-arc lamps of the inverted type on ornamental posts now in service—63 of these lamps burning all night every night from one-half hour after sundown until one-half hour before sunrise, 126 lamps burning every night from one-half hour after sunset until 12 o'clock midnight—and 255 ornamental cluster posts, consisting of one 60-watt and four 40-watt Mazda lamps, burning one 60-watt lamp on the top of these posts all night every night from one-half hour after sunset to one-half hour before sunrise, and four 40-watt Mazda lamps on each post every night from one-half hour after sunset until midnight, which constitutes the same number of lamps as are now in service, for the total sum of $12,000 per annum, payable one-twelfth monthly.

"Second—We will furnish the electric energy at our power station on Spy Run Avenue necessary for the following lamps now in service: 670 4-amp. magnetite-arc lamps, suspended type, burning all night every night from one-half hour after sunset to one-half hour before sunrise, and 189 4-amp. magnetite-arc lamps of the inverted type on ornamental posts, burning all night every night from one-half hour after sunset until one-half hour before sunrise, and 255 ornamental cluster posts, consisting of one 60-watt and four 40-watt Mazda lamps, burning all night every night from one-half hour after sunset until one-half hour before sunrise, which constitutes the same number of lamps as are now in service, for the total sum of $21,000, payable one-twelfth monthly.

"These proposals are made with the understanding that the mercury-arc rectifier sets complete, which include all of the arc-lighting apparatus in the municipal lighting plant at present, shall be transferred to the company's power house on Spy Run Avenue, at the company's expense, for the use of the city under the contract hereinafter mentioned. The title to all such rectifier sets shall remain in the city, and they shall be returned to the city and set up in its plant at the termination of such contract, at the company's expense, in as good condition as they now are, except the usual wear and depreciation thereof. The company's line will be extended at the expense of this company from its Spy Run power station to and connected with the city's arc-light circuits at the city's power plant, in order that electrical energy may be furnished in accordance with either of the above proposals.

"These proposals are made with the understanding that a contract will be entered into for a period of ten years, and in case additional electric energy is desired during the life of this contract for additional lamps of the same kind, or similar lamps consuming the same amount of electrical energy, connected by the city to the present or additional arc-light circuits, the same will be furnished on a pro-rata basis. The city shall, as heretofore, furnish, maintain and keep in repair all the poles, wires and lamps, the same to be kept in good operating condition.

"For your information we wish to advise you that, according to the rates now charged for electrical energy only, for street-lighting service, the following is a statement of the annual expense:

670 arc lamps at $53 per year	$35,510
189 arc lamps at $56.50 per year	10,678
255 ornamental-cluster posts at $21	5,355
Total	$51,543

"If proposal No. 1 is accepted by your board, this will mean a saving to the taxpayers of $39,543 per year, or a saving of $395,430 for the period of the proposed ten-year contract.

"If proposal No. 2 is accepted by your board, there will be a saving of $30,543 per annum, or a saving to the taxpayers of $305,430 for the period of the proposed ten-year contract, and in addition the city will also be lighted all night every night."

Laying Submarine Cables Across the Golden Gate

Messenger-Cable Method Surmounted Difficulties Due to Swift Currents, Deep Water and Fog in Carrying Two 250,000-Circ. Mil Cables Into San Francisco

RECENT load increases on the San Francisco distribution system of the Pacific Gas & Electric Company are now being served by a lately completed high-tension transmission line connecting the Cordelia substation 45 miles north of the city with a transformer station on the north shore of the Golden Gate. At the latter point energy is stepped down from 60,000 volts to 11,000 volts and is transmitted to San Francisco distributing points through two submarine cables laid across the Golden Gate during the latter part of last October.

The laying of the two cables, each about 13,500 ft. long, presented new problems, because it was necessary to cope with swift tidal currents and a very irregular bottom in deep water. Moreover, there was frequently the danger in the heavy fogs of being fouled by the ships that ply continually in and out through the Golden Gate. Both cables, however, were laid without accident of any kind, and final tests were completed within forty days after the barge left shore with the first power cable.

MESSENGER AND POWER CABLES

Each of the power cables consists of three stranded-copper conductors having a net area of 350,000 circ. mil. at the shore ends and 250,000 circ. mil. for the length in deep water. The former is 4.5 in. in diameter, weighing about 22 lb. per foot, while the latter measures 4 in. and weighs 19 lb. per foot. Each conductor has an insulation of 6/32 in., 30 per cent para rubber compound, taped with a 1/16-in. layer of varnished cambric and wound with a spiral wrapping over jute insulating compound filler. This wrapping was protected by a 5/32-in. thickness of varnished cloth, over which a 5/32-in. lead sheath was used, and this in turn was covered with a coating of jute and wrapped with forty-two No. 4 B. W. G. extra-galvanized armor wires. Finally a finishing jute coating was put on over the armor. The cables were delivered on the barge in reels containing 1275 ft. and weighing 15 tons each.

The laying of the power cables was carried on by the same method used in the laying of the Great Western Power cable across another part of San Francisco Bay and described in the ELECTRICAL WORLD of July 4, 1914; but, owing to the peculiar difficulties of the work across the Golden Gate, certain alterations and improvements in the method were necessary. The steel messenger cables, each 14,000 ft. in length and 1⅜ in. in diameter, were laid first. These were built by John A. Roebling's Sons Company, and consist of thirty-seven strands of No. 4 B. W. G. galvanized-steel wire woven as cable instead of rope. The breaking strength of the cable is rated at 90 tons. At either shore end this cable was passed around a sheave anchored in concrete.

Owing to the swift tidal currents, it was deemed preferable to pay out the power cable from a barge headed into the current rather than across as in the previous work, and the spools were accordingly mounted on the barge as shown in the accompanying illustration. The barge used was 75 ft. by 30 ft. in plan, with a capacity of 150 tons. The crew consisted of eight men, exclusive of the 40-hp. gasoline launch tender which was used to advance the barge when actually paying out cable. The power cable was made fast to the messenger cable by a continuous wrapping of No. 6 steel wire supplemented at intervals of 20 ft. by a lashing. With this system the maximum drift of the barge off the original course of the messenger cable was not more than 200 ft. From the substation on the north shore megger tests were made continuously, and every few thousand feet, while the splice was being made on the barge, full 22,000-volt tests were made.

Included within the jute filler between the conductors was a twisted pair of No. 13 B. & S. copper telephone wires insulated with 2/32-in. varnished cambric. At the splices these leads were alternated so as to be adjacent to different conductors in each successive length of power cable. At the terminals the telephone leads were brought out of the cable and passed through an insulating transformer. Voice transmission with the telephone line is said to be as satisfactory as over wires strung on the poles of an ordinary transmission line.

CABLE GUIDES AND WINDING ENGINE

Two new features of this method of cable laying were developed specially for the work in the Golden Gate,

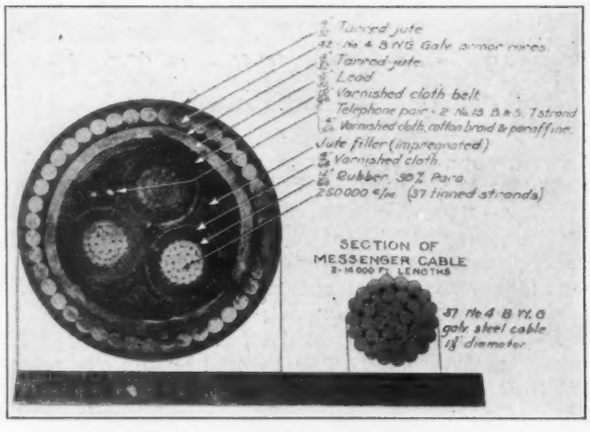


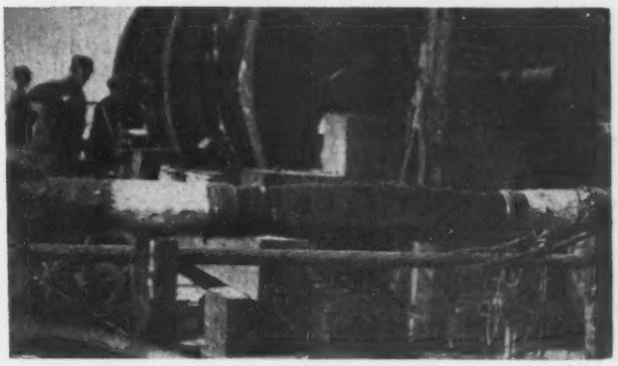
FIG. 1—INSULATION FEATURES AND POSITION OF TELEPHONE WIRES IN 11,000-VOLT CABLE, TOGETHER WITH CONSTRUCTION OF MESSENGER CABLE

namely, the cable guides and the winding engine. The cable guide was designed to allow the cable free motion about the sheave axle at the same time that it prevented any deflection in a horizontal plane which would tend to throw the cable off the sheave as the tension varied with different depths or as the cable was under-run. It consisted of a heavily constructed timber frame supporting two pair of guide rollers and carrying idlers for directing the cables. The entire rig was hung on the sheave axle.

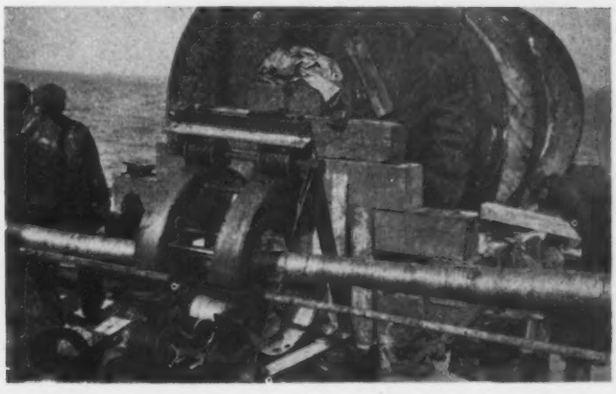
An engine-driven winding reel made it possible to put the wrapping on each splice by machine in six hours less time than required by hand operation. The reel consisted of a steel frame carrying a drum through which the power cable could be passed and which carried two spools of wire. These spools were unwound by the revolution of the drum as fast as the wire was used on the cable wrapping. The drum was driven by a belted connection with a gasoline engine. By using this winding device the normal time for completing the power cable splice on the barge was eight hours.

One of the difficulties of the work was the great irregularity in the depth of the water, which ranged up to a maximum of 210 ft. This made it difficult to con-

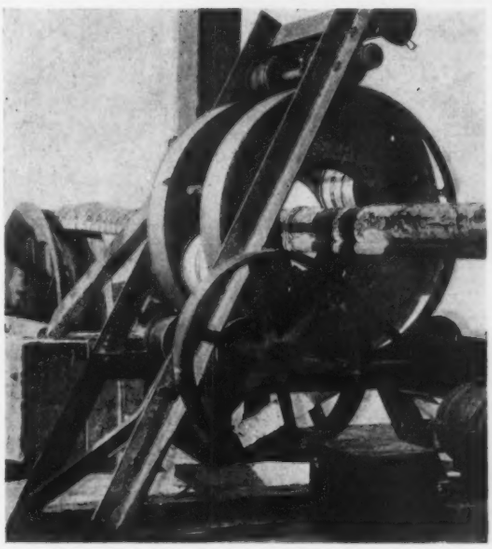
Operations in Splicing Cable and Applying Armor Aboard Barge

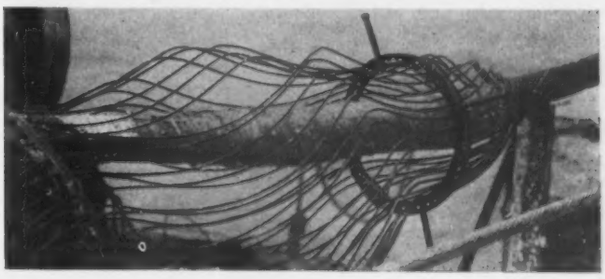


END OF CABLE READY FOR MAKING OF SPLICE, AND THE TAPED JOINT



APPLYING LEAD SLEEVE, AND THE COMPLETED JOINT BEFORE ARMORING





RINGS TO HOLD ARMOR DURING SPLICING, SERVING MACHINE, AND LAYING BARGE

Each cable was laid in sections about 1275 ft. long, which called for the making of eleven splices aboard the barge. When a length of cable had been paid out the messenger was made fast in a grip on one side of the barge. To secure sufficient armor to make the required 15-ft. lap for a strong joint it was necessary to cut off 15 ft. of the cable projecting out of the water. The armor was then folded back and held in place and shape by holding rings for laying back in final position. The copper conductors were sweated together, taped and insulated, and the joint was covered with a single lead sleeve 4.5 in. inside diameter by 5/16 in. thick and 24 in. long. This joint was then filled with "ozite" compound at a temperature of 460 deg. Fahr., sufficient to vulcanize the rubber tape on the conductors. The joint was finally sealed and burlap dipped in hot insulating compound applied over the splice. The armor wires were replaced over the splice by the barge-serving machine shown in one of the accompanying illustrations. Every 12 in. the serving wires were soldered to prevent unwrapping in case of a break. In paying the splice overboard care was taken to protect it from strains. It required about twenty-four hours to pay out one length of 1275 ft. of cable and make a splice. The speed when laying the cable was about 8 ft. per minute. Some of the steps in paying out the cable and making the splices, together with views of the serving machine and laying barge, are shown in the above illustrations.

trol the slack in the messenger cable, particularly since this had been laid on a curve in order to take advantage of the most favorable conditions of tidal currents and depths. The maximum tidal flow is rated in government records as 6 knots per hour, but the work of paying out the cable could not be safely carried on when the tidal currents were at a maximum. By keeping the barge headed into the current, however, the pressure was much less than in the earlier work in which the barge had to be advanced broadside. The final position of the power cable on the bottom is considered entirely satisfactory.

The submarine cables installed connect with two underground cables on the San Francisco side. It was necessary to use two cables because the size of duct lines would not accommodate one cable with a rating equivalent to the submarine cable.

Tests on Cables

Exceptional opportunities were available in connection with this installation for determining heating tests

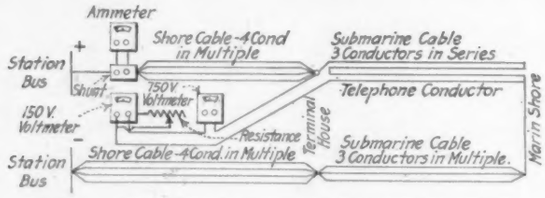


FIG. 2—CONNECTIONS OF CABLES DURING TESTS

on submarine cables. By means of an available 650-volt, 1000-kw. direct-current generator it was possible by connecting the cables in the manner shown in Fig. 2 to circulate direct current through the conductors of the submarine cable. The telephone wires in the cable and on the San Francisco shore end were used as pressure wires. It was therefore possible to determine the voltage drop in the cable for any given load.

From the observations obtained the temperature curves of Fig. 5 were plotted. The solid curves show the rise in temperature of the submarine cable for loads of 300 amp. and 350 amp., the temperature of the bay water being 12 deg. C. As each cable contained quite a few splices, and as the insulation around the splice was much greater than the insulation around the cable, laboratory tests were made on a splice under temperature conditions similar to those surrounding the splice in the water. The rise in temperature for the splice, according to these tests, is also shown in Fig. 5.

From the curves it will be seen that cables immersed in water of 12 deg. C. have a comparatively high carrying capacity. These tests were conducted for a period of twelve hours, which was long enough for the temperature to become steady, although the curves of Fig. 5 do not show this.

The shore ends of 350,000 circ. mil are not entirely under water. It was therefore necessary to make the same tests on these cables. The dotted curves of Fig. 5 show the temperature curves for the shore ends. As the life of the rubber insulation depends largely upon the temperature to which the rubber is subjected, it can therefore be seen that the safe carrying capacity of the cables is approximately 350 amp., owing largely to the radiating capacity of the splices and the large size of the shore ends, although under emergency conditions for very short periods of time the cables could safely carry as much as 400 amp.

The specifications called for a test pressure of 30,000

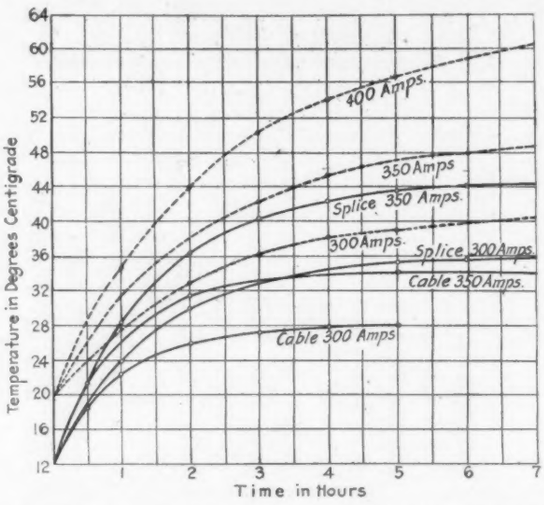
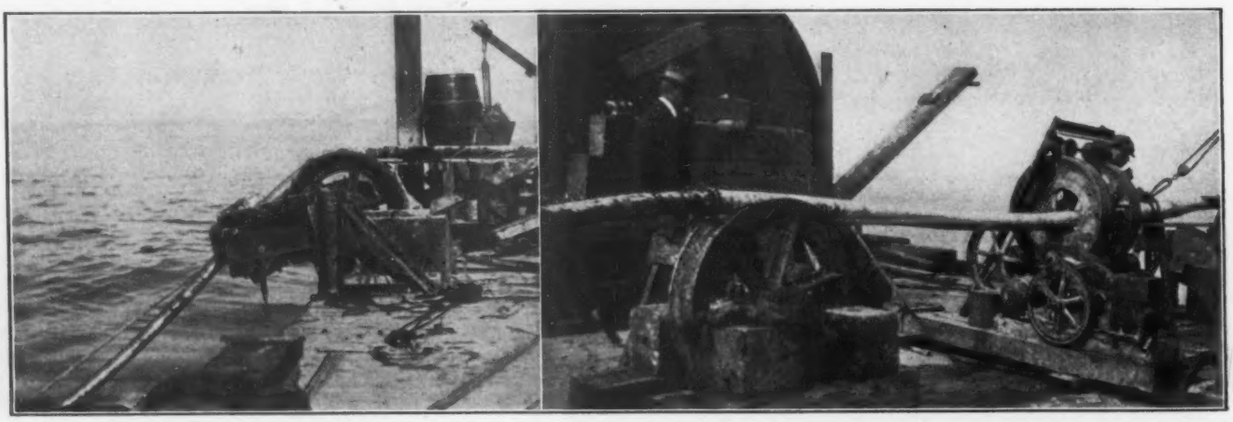


FIG. 5—TEMPERATURE RISE IN THE CABLES—SOLID CURVES FOR SUBMARINE SECTIONS AND DASHED CURVES FOR SHORE ENDS

volts for thirty minutes at sixty cycles between conductors and between conductors and ground at the factory before leading. The telephone conductors were required to withstand a pressure of 4500 volts between conductors and between conductors and ground. On final break-down test it required 100,000 volts to puncture between conductors of the main cable and 46,000 volts between conductors of the telephone cable.

The cable was laid for the Pacific Gas & Electric Company by A. J. Pahl of San Francisco, Cal., who holds patents on the messenger-cable-laying method used. Those in charge of the work for the company were P. M. Downing, chief engineer of the hydroelectric section, and S. J. Lisberger, engineer of electrical distribution, assisted by H. C. Vansano, J. P. Jollyman and A. R. Thompson.



FIGS. 3 AND 4—PAYING OUT CABLE FROM BARGE, AND SERVICE MACHINE FOR MAKING CABLE SPLICE

Important Cases Pending Before Commissions

Questions Involve Valuations of Properties for Rate-Making and Condemnation Purposes and Invasion of Territory Already Served

MANY cases involving in their adjudication a mass of engineering data and testimony are now pending before public service commissions throughout the country. It would appear that as the commissions grow in age and experience the questions brought before them become more and more intricate and call for the services of the best engineering experts. Indeed, many large consulting engineering firms whose work has been very much curtailed owing to lack of new developments are now engaged in valuation work for public utility and public service commissions as well. Of course, since the question of rates for service is bound up with the question of obtaining an adequate return on the investment, the latter must first be obtained by means of an appraisal. Hence many of the important cases now pending cannot be decided until the various properties in question have been valued. This again gives rise to dispute as to the fairness of the valuation considered from the owner's standpoint and also from the standpoint of the general public. Not infrequently, valuations of the same property made by different engineers of accepted standing vary considerably.

SOUTHERN CALIFORNIA EDISON CONDEMNATION PROCEEDING

The Public Service Commission of California has just concluded hearings on the valuation of that portion of the property of the Southern California Edison Company which is desired by the city of Los Angeles. The questions involved make this one of the most important cases now before any commission. The company is strong financially, well managed, and has developed its territory almost to the saturation point. To take from it its distribution system and its load in the city of Los Angeles will deprive it of the cream of its business, necessitate material changes in its distribution system, and in many other ways throw a most admirable public-utility corporation out of joint.

The case has been reported quite fully in these columns from time to time, and a rather full abstract of the valuation report of Chief Engineer Saches of the California Railroad Commission will be found in the issue of Jan. 22, 1916. Even after the commission has rendered its decision, it is more than probable that the case will not finally be disposed of until it has been passed upon by the highest court in the land.

VALUATION OF PUBLIC SERVICE ELECTRIC COMPANY

The most important electric-utility case now pending before the Board of Public Utility Commissioners of New Jersey, which has supervision over all utilities of the State, is the valuation of the Public Service Electric Company, a subsidiary of the Public Service Corporation of New Jersey.

The investigation has been going on for about a year and a half, and since it was expected that the inventory and appraisal would be contested by the company, it was made a joint affair, the commission employing as experts D. C. & W. B. Jackson of Boston. The work was divided into three parts—first, an inventory of the property shown on the books of the company at its birth in 1903; second, an inventory of the property created by subsidiaries, and, third, that property not used at all in electric operation. It was primarily on part two that the Boston engineers were employed.

The inventory and appraisal have been completed and a report has been made including all power stations, all substations, all overhead transmission lines, all distributing systems, and all property on the premises of the consumers excepting the meters. The report does not include meters, tools and vehicles, portable measuring instruments, materials and supplies, working capital or any underground conduit and cable. It is expected that a summary of the inventory will be completed by the company about the middle of March.

CASES BEFORE THE PUBLIC UTILITIES COMMISSION OF OHIO

There are now pending before the Public Utilities Commission of Ohio several important cases involving electric-lighting companies, chief of which are the appeal of the Union Gas & Electric Company and the Cincinnati Gas & Electric Company from a lighting-rate ordinance and the appeal by the Cleveland Electric Illuminating Company from a lighting-rate ordinance passed by the City Council of Cleveland.

In the Cleveland Electric Illuminating Company case the commission is appraising the property of the appellant. Following the appeal of the major company, similar appeals were instituted by the Cleveland Light & Power Company, the Bradley Light, Heat & Power Company, the Caxton Power Company and the Arcade Service Company, small utilities operating in Cleveland.

CINCINNATI RATE CASE

In the case of the Union Gas & Electric Company and the Cincinnati Gas & Electric Company, the commission has certified a tentative valuation of the electrical property against which both the companies and the municipality have protested. The brief of the utilities was filed recently. It is contended by the company that: (1) the commission has not valued certain items which must be included in any consideration of "fair value for rate-making purposes," particularly "the cost of franchise" and the "cost of financing"; (2) while the company contends that there should be no deduction for "accrued depreciation" in any valuation of its property for rate-making purposes, but that its rates should be at least sufficient to afford a return upon the entire value of its property now, the amount deducted by the commission in reaching "present value" as found in the order of the commission is excessive and does not truly represent the "lessening in value of the property on account of its lack of newness," irrespective of whether or not such an amount should be deducted for rate-making purposes; (3) the company has filed its detailed valuation giving its estimate of the real value of the property, and the value as tentatively found by the commission is unduly low. This is particularly true of the items "land," "working capital" and "cost of developing the business," but such comparisons as have been made give evidence of additional undervaluations both in detail and in the aggregate. The protest of the city of Cincinnati was based on the claim of over-valuation.

After the briefs are in, the matter will be ready for the certification of a final valuation and the taking up of the rate question.

INVASION OF OCCUPIED FIELD

There is pending before the Public Utilities Commission of Idaho for decision probably the most important

issue from an electrical standpoint in the history of the commission, involving as it does three important questions—first, ownership of a substation; second, the constitutionality of the amendment to the utilities act, or whether or not the provisions of the act are in contravention of the fourteenth amendment to the federal constitution, and, third, State commission or Interstate Commerce Commission jurisdiction. The case involving these issues is entitled the Washington Water Power Company versus the Federal Mining & Smelting Company, the Tamarack & Custer Mining & Concentrating Company, the Montana Power Company and the Thompson Falls Power Company.

Prior to the convening of the last Legislature a controversy developed between the two mining companies named above, large operators and users of electricity in the famous Cœur d'Alene mining section of Idaho, over the rates charged for power by the Washington Water Power Company of Spokane, Wash., whose lines extend into the Cœur d'Alene mining district, where the company has developed considerable load. This controversy led the two companies named and others operating in the same territory to seek another source for electrical energy. Just over the Idaho line in Montana the Montana Power Company and the Thompson Falls Power Company, closely affiliated, have large hydroelectric plants and serve an extensive field. Negotiations were opened by the Idaho mining corporations to secure electrical energy from them. Those two companies forthwith extended their lines to the Idaho-Montana boundary line. The Washington Water Power Company then stepped in, the Public Utilities Commission having been created, and instituted a complaint against the defendants named, contending that the Montana Power Company and the Thompson Falls Power Company, having no certificates of convenience and necessity, could not operate in the Idaho field outside the jurisdiction of the Idaho Public Utilities Commission.

To eliminate this drawback an amendment to the utilities act was passed. This amendment contained the following provision: "No certificates shall be required under any provision of this act where the electricity to be used exclusively in operations incident to the workings of metalliferous mines and mining claims, mills or reduction and smelting plants and the transmission lines and distributing systems are owned by the consumers, or where several consumers severally own their individual distributing systems and jointly own, in their own names or through a trustee, the transmission lines used in connection therewith and transmit such electricity, whether generated by themselves or procured from some other source, over such transmission lines and distribution systems without profit and to be used for their private uses for the purposes aforesaid in places outside the limits of incorporated cities, towns and villages, and not for resale or public use, sale or distribution."

However, the suit instituted by the Washington Water Power Company was still pushed. Recently the Public Utilities Commission conducted a hearing at Wallace upon the issue. The mining companies still insist that they are entitled to secure power from the Montana companies. They have built transmission lines to the Idaho-Montana line to receive the power from the lines built from the Montana side. A substation has been installed. The question of ownership of this substation is at issue and has an important bearing on the outcome. It is very probable the case will be carried on appeal to the Supreme Court of the United States for an ultimate decision.

Because the power originates in Montana and is carried by Montana company power lines to the Idaho-Montana line and there received by the power lines of the mining company, the question of Interstate Commerce Commission jurisdiction has also been raised on the ground that such service is interstate.

The Washington Water Power Company maintains that it is willing to continue the supply of electrical energy for all the uses of the mining companies.

Cases Before New York Commission

The case of Moritz et al. versus the Edison Electric Illuminating Company, which has been pending on the commission's docket for more than three years, will, it is expected, be brought to a close within the next two months. Over 8000 pages of testimony are in the record, and a very large number of statistical and engineering exhibits have been filed. The case was originally brought before Commissioner Maltbie, and on his retirement was carried forward by and is now in the hands of Commissioner Hayward.

A valuation of the physical property amounting to approximately $24,000,000 was made by the staff of the commission's electrical engineer, Clifton W. Wilder, in co-operation with the company's consulting engineers, Messrs. Sanderson & Porter. An interesting feature of this case will be the determination of the commission on the subject of so-called depreciation. Engineer Wilder filed a determination on depreciation based upon the conventional straight-line method, but later repudiated that method and filed a new exhibit based upon an original method wherein the renewal and replacement requirements are determined for each year, and this value for any year is to be supplemented by any existing deferred maintenance observable at that time. The company has filed exhibits and is arguing for a complete list of overheads, including going value.

The commission has also recently ordered its electrical engineer to make an inventory and appraisal of the property of the New York Edison and United Electric Light & Power companies of New York City.

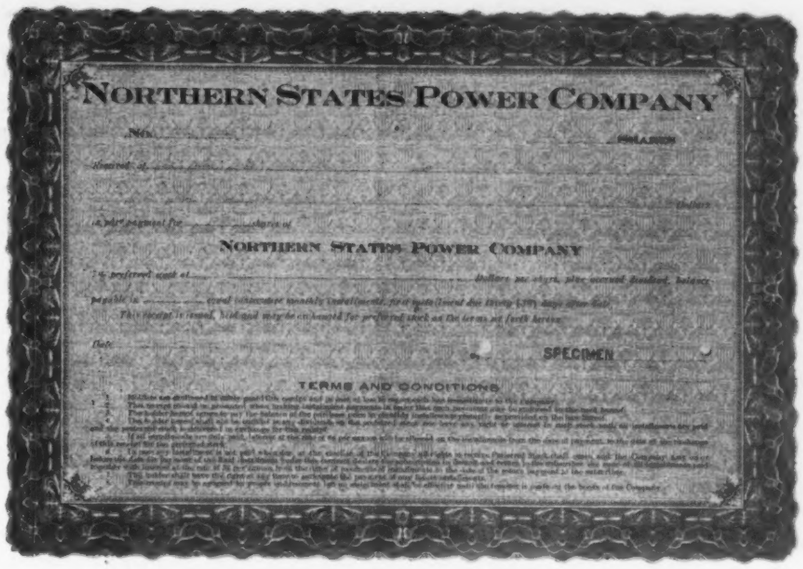
It is estimated that this inventory and appraisal may take between one and two years to complete, and the presumption is that the commission is ordering this inventory for its own information, as the companies have no rate cases pending against them at this time.

Philadelphia Electric Company Case

The case now pending against the Philadelphia Electric Company was instituted by Morris L. Cooke, joined by others, including William Hancock and William H. Ball, business men.

The case has been pending for about two years, and a valuation on the reproduction-new basis (five years to construct) was made for the company by W. B. & D. C. Jackson, consulting engineers, of Boston, at a cost approximating $200,000. At the company's suggestion, the complainant and the commission joined with it in the determination of the net physical property cost, and a committee was appointed the principal members of which are Frederick W. Ballard for the complainant, Dr. Milo R. Maltbie for the commission, and Messrs. Sanderson and Porter for the company. It is expected that this committee will report within the next month.

Testimony is being taken in the case now by Commissioner John Monaghan, who is sitting in the Philadelphia City Hall. Frederick W. Ballard, ex-superintendent of the Cleveland municipal light plant, has been on the staff as a witness in rebuttal during the past week, and, according to his testimony, which has been published broadcast in the Philadelphia papers, the property is worth about one-half of the amount previously estimated by expert witnesses in the case. Mr. Bemis of Washington will follow Mr. Ballard on the witness stand this week.


NORTHERN STATES POWER COMPANY

NORTHERN STATES POWER COMPANY

SPECIMEN

TERMS AND CONDITIONS

NORTHERN STATES POWER COMPANY STOCK CERTIFICATE

Terms and Conditions

1. Holders are cautioned to guard this receipt safely and in case of loss to report such loss immediately to the company.
2. This receipt should be presented when making installment payments in order that such payments may be indorsed on the back hereof.
3. The holder hereof agrees to pay the balance of the purchase price in monthly installments promptly as provided on face hereof.
4. The holder hereof shall not be entitled to any dividends on the preferred stock nor have any right or interest in such stock until all installments are paid and the preferred stock is delivered in exchange for this receipt.
5. If all installments are duly paid, interest at the rate of 6 per cent per annum will be allowed on the installments from the date of payment to the date of the exchange of this receipt for the preferred stock.
6. In case any installment is not paid when due, at the election of the company all rights to receive preferred stock shall cease, and the company may on or before the date for payment of the final installment under this contract declare the subscription in default and return to the subscriber the sum of all installments paid together with interest at the rate of 3 per cent per annum from the dates of payments of installments to the date of the return payment to the subscriber.
7. The holder shall have the right at any time to anticipate the payment of any future installments.
8. This receipt may be assigned by proper indorsement.

Taking the Customer Into Partnership

BY EARL E. WHITEHORNE

It has long been recognized by men of foresight in the industry that the selling of securities of a public-service corporation among the customers it serves brings an excellent influence for the improvement of public sentiment. The principle has been applied in several instances, and most successfully, by central stations that have offered special issues of their stocks or bonds, of small denomination, to the general public in the communities they serve, instead of placing them upon the usual distant market. Here is a case where the preferred stock of a holding company has been sold among consumers served by subsidiary companies, not for the purpose of raising funds but purely as a means of taking the customer into partnership and making him feel a greater interest in the local utility. It has been a most remarkable experience and every central-station man should know about it.

FOR the last eight months the Northern States Power Company has been carrying on a selling campaign directed solely to securing stockholders among the consumers of its subsidiary companies, and the story of this campaign is interesting. The Northern States Power Company is a holding company under which are grouped ten central-station properties in the cities of Minneapolis, St. Paul, Stillwater, Mankato and Faribault, Minn.; Fargo, Grand Forks and Minot, N. D.; Sioux Falls, S. D., and Galena, Ill., these properties being operated by H. M. Byllesby & Company of Chicago. The idea behind the campaign was the principle that what a man or a woman owns becomes of interest and of value to the owner, whether it be personal possessions bought and carried home or ten shares in the local lighting company, and that the sale of such securities among the small investors of the city served would be a most effective means of strengthening the bond of sympathy between the public and the service company. For it is only natural that he who feels a share of ownership in the utility should have a more intelligent appreciation of the service that it renders and defend it against unjust criticism by those who do not understand. In short, it was believed such a distribution of securities would serve four useful purposes:

1. To make the public and the utility company actually financial partners as well as partners in the work of community advancement.

2. To offer to the public sound investment for the surplus capital and savings of the citizens in stable enterprises which they have under their immediate personal observation.

3. To gain a long step forward toward the popularizing of utility companies that are seen to be doing their work creditably, honestly and efficiently.

4. To bring about a practical distribution of profits among consumers.

5. To pave the way toward obtaining, at the lowest cost, any part of the funds for construction purposes which it may be necessary from time to time for utilities to secure in the general investment markets of the country.

THE CONDITION OF THE SALE

The sale of this stock was begun in June, 1915, though no new issue of securities was available for the purpose. It was simply decided that such a retailing of stock to service customers was a most desirable measure for the upbuilding of local public sentiment, and to fill the orders that were secured outstanding stock was purchased by the company for resale to those consumers who applied for it. As the first step in the campaign a circular letter was sent out to the customers of each company, written on that company's letterhead and signed by the local manager. This letter explained both the value of the modern holding company as a profitable investment and the purpose of the offer, as follows:

UNION LIGHT, HEAT & POWER COMPANY

FARGO, N. D., June 7, 1915.

TO OUR CUSTOMERS:

The writer has had many inquiries from residents of Fargo and vicinity regarding the investment of funds in this company.

Our company is part of the Northern States Power Company, which is performing important work in the material development of North Dakota and adjoining states. Other utility companies composing this large system serve the cities of Minneapolis, St.

Paul, Stillwater, Faribault, Northfield, Mankato, Grand Forks, Minot, Sioux Falls and Galena—the last-named being the location of the power plant serving the Illinois-Wisconsin zinc field.

By grouping a number of utility companies into one strong organization it has been possible to bring about a large amount of useful construction, permitting the highest operating efficiency, enabling liberal and progressive methods, making possible the present low rates, and making practicable the extension of service to many additional communities and individuals.

There are about 2700 stockholders in the Northern States Power Company. We desire to encourage increasing proprietorship in the company by citizens of North Dakota and adjoining states, and an opportunity is now available to local investors to become financially interested in one of the most important enterprises in this community, and to share in the moderate returns following progressive and economical management and full consideration for the rights of the public.

Arrangements have been made whereby the 7 per cent preferred stock of the company may be purchased either through the First National Bank of Fargo or at our office.

This 7 per cent preferred stock has paid full dividends regularly since organization in 1909. It is in demand as a conservative investment; has an established market, enabling the holder to convert readily into cash if desired, and can be purchased at present at about $87.50 per share, at which price the investor will obtain 8 per cent on his money. No new stock is being issued.

Inasmuch as the stock comes in hundred-dollar shares, small investments are possible and are cordially welcomed. Descriptive circular will be furnished upon request, and I shall be glad to give you any additional information.

I believe this is an excellent opportunity of securing a 7 per cent preferred stock with an established market and earning power which makes it a safe investment, and I should like to see as many of our customers as possible share in the earnings not only from this property which serves you directly but from the Northern States Power Company, whose gross earnings for the year ended Dec. 31, 1914, were over $4,584,000. Yours very truly,

M. L. HIBBARD, Manager.

THE EASY-PAYMENT OFFER

This was followed up by advertisements in the local newspapers of each community, by special notices printed on the backs of bills, and by the distribution of a leaflet bearing pictures of a number of the Northern States power plants with statistics on the companies that operate them. Then, shortly after the first letter was sent out, it was decided to facilitate the sale by offering to accept installment payments, and this second letter was written to announce the plan:

UNION LIGHT, HEAT & POWER COMPANY

FARGO, N. D.

TO OUR CUSTOMERS:

The response to our offer of some weeks ago enabling our customers to invest in the 7 per cent preferred stock of the Northern States Power Company (of which organization our company is a part) has been so gratifying that it has been decided to keep this method of establishing closer relations between the company and its customers in effect and further to develop it as described below:

On and after Aug. 10 investment in Northern States 7 per cent preferred stock may be made either by cash purchase or upon the partial-payment plan at the rate of $5 per share per month.

In this way from one to ten shares may be secured by any customer upon a small-payment basis—complete payment being made in about eighteen months. Not more than ten shares will be sold to any individual under the partial-payment plan.

It is believed that the partial-payment plan will best serve the objects sought—namely, the financial interest of a large number of people in the communities served by the organization and a wide distribution of the stock and earnings among our customers.

The prospective investor on the partial-payment plan is cordially welcomed. All inquiries, whether in person, by mail or telephone, will receive the very best and most complete attention in our office or at the First National Bank.

The safety of this investment is grounded on the stability of more than forty communities to which service is rendered in Minnesota, North and South Dakota, Illinois and Wisconsin, including the largest cities in the three states first named. Dividends at the rate of 7 per cent per year have been paid quarterly in July, October, January and April since organization in 1909. The company is showing a substantial growth in business.

We wish to acknowledge our appreciation of the confidence in the methods and management of our organization expressed by the many customers who have already become interested in this investment. Such confidence is an incentive to continuous effort in the efficient service of the public.

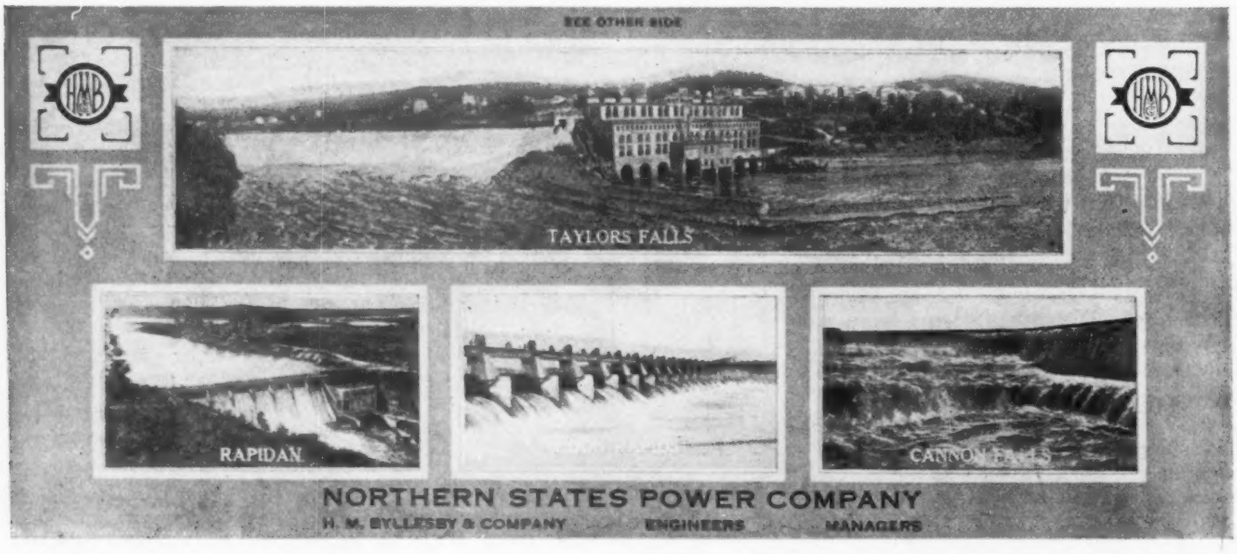
Subscriptions on the partial-payment plan are now being received at a price of $90 per share (par value $100). Any further information desired will be furnished upon request. Yours truly,

M. L. HIBBARD, Manager.

HOW THE SELLING WAS DONE

In all, but seven advertisements have been featured in the newspapers since June, and from the beginning the entire plan has been handled in a very conservative way. There has not been the slightest effort to speed up sales or to make a drive at the disposition of securities; for the whole idea has been to lay the foundation for a permanent source of equity financing which will at the same time secure the active interest of an increasing number of people in each home territory. Most of the sales have been made by the company's own representatives, though in nearly every city some bank or other financial institution also has the stock for sale.

The large number of inquiries received at Minneapolis and St. Paul soon made it necessary to establish a securities department for those properties in charge of an experienced salesman, who now has two assistants, for this department has become a very busy one. From June 1 to Dec. 31, for instance, 951 inquiries were received in writing, and in addition to this there were quite a number of inquiries by telephone and in person.

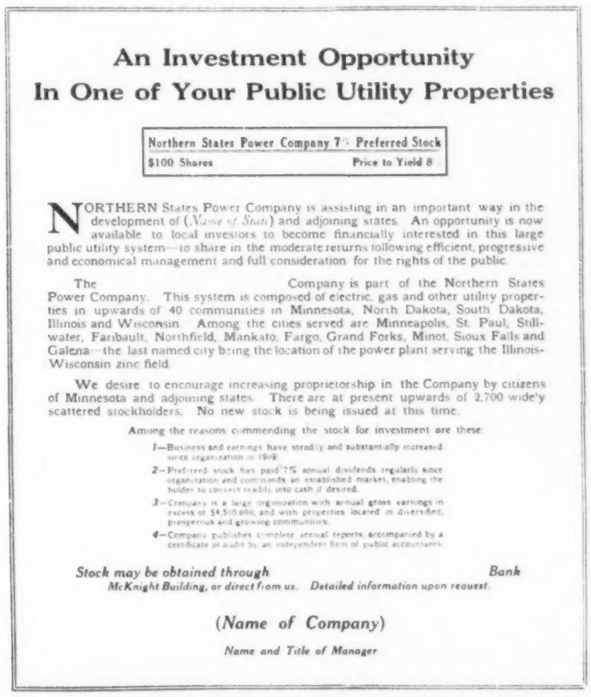


A PAGE OF PICTURES DISTRIBUTED AMONG PROSPECTIVE STOCK PURCHASERS TO AFFORD THE PUBLIC A CONCRETE IDEA OF THE MAGNITUDE OF THE PROPERTIES OF THE NORTHERN STATES POWER COMPANY

These inquiries that have come in have been found to emanate in the majority of cases from the newspaper advertisements, even though so few of these were published. Many answers, however, were received after the mailing of the letters from the managers. The advertising on the reverse side of the stubs of the monthly bills is also exceedingly productive, and the fact that the consumer is required to sign his name has automatically weeded out the curiosity seekers. These stubs come back to the cashier as the bill is paid and are bringing in inquiries at the rate of from four to ten a day in some of the larger cities.

THE RESULTS IN FIGURES

The partial-payment plan for some reason did not seem to gain much popularity at first, though lately it has been growing steadily in favor as it has become more generally understood by the interested public. In spite of this appealing "easy-payment" opportunity, however, over 90 per cent of the stock that has



An Investment Opportunity
In One of Your Public Utility Properties

Northern States Power Company 7% Preferred Stock
$100 Shares — Price to Yield 8

NORTHERN States Power Company is assisting in an important way in the development of (*Name of State*) and adjoining states. An opportunity is now available to local investors to become financially interested in this large public utility system—to share in the moderate returns following efficient, progressive and economical management and full consideration for the rights of the public.

The Company is part of the Northern States Power Company. This system is composed of electric, gas and other utility properties in upwards of 40 communities in Minnesota, North Dakota, South Dakota, Illinois and Wisconsin. Among the cities served are Minneapolis, St. Paul, Stillwater, Faribault, Northfield, Mankato, Fargo, Grand Forks, Minot, Sioux Falls and Galena—the last named city being the location of the power plant serving the Illinois-Wisconsin zinc field.

We desire to encourage increasing proprietorship in the Company by citizens of Minnesota and adjoining states. There are at present upwards of 2,700 widely scattered stockholders. No new stock is being issued at this time.

Among the reasons commending the stock for investment are these:

1—Business and earnings have steadily and substantially increased since organization in 1909.

2—Preferred stock has paid 7% annual dividends regularly since organization and commands an established market, enabling the holder to convert readily into cash if desired.

3—Company is a large organization with annual gross earnings in excess of $4,500,000, and with properties located in diversified, prosperous and growing communities.

4—Company publishes complete annual reports, accompanied by a certificate of audit by an independent firm of public accountants.

Stock may be obtained through Bank
McKnight Building, or direct from us. Detailed information upon request.

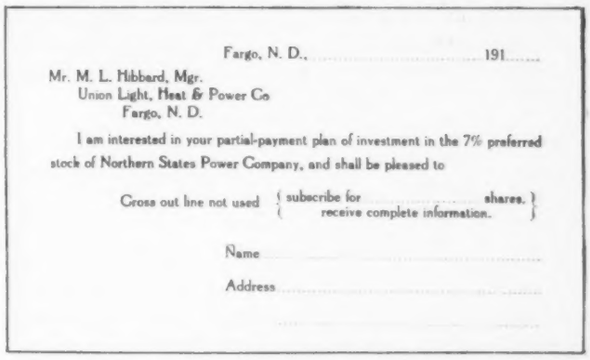
(Name of Company)
Name and Title of Manager

ONE OF THE NEWSPAPER ADVERTISEMENTS THAT PROVED OF THE GREATEST INFLUENCE IN THE CAMPAIGN

been sold so far in this campaign has been paid for in cash by preference. The price has been governed by the market price prevailing in New York and Chicago, plus a nominal amount for handling, and has ranged from $87.50 per share to $96.06 per share. So far—that is, up to Feb. 10, 1916—this 7 per cent preferred stock of the Northern States Power Company has been sold in home territory to the amount of $309,600 par value and has been purchased by 522 investors, 96 of whom have taken advantage of the installment offer.

THE INFLUENCE ON THE PUBLIC

So much for the statistics of the campaign, for, after all, that is not the most important phase of the experiment. It has proved satisfactorily that the public is alive to the investment value of the local public-service enterprise and is disposed to have a hand in it if some one brings the matter to the notice of the people and makes it easy for them to buy stock. It has demonstrated equally that there is ample opportunity for any central station doing business in the right way to obtain funds easily and in surprising volume by the offer of appropriate securities to the small investors numbered among the customers whom it serves. For, if an initial offer of this kind in six months has produced $300,000 without pressure in the selling or inducements to the man with money to invest, how much greater will be the response in years to come, when these well-satisfied investors will have bred as many more disposed



Fargo, N. D., ... 191.....

Mr. M. L. Hibbard, Mgr.
Union Light, Heat & Power Co
Fargo, N. D.

I am interested in your partial-payment plan of investment in the 7% preferred stock of Northern States Power Company, and shall be pleased to

Cross out line not used { subscribe for ..... shares. / receive complete information. }

Name .....

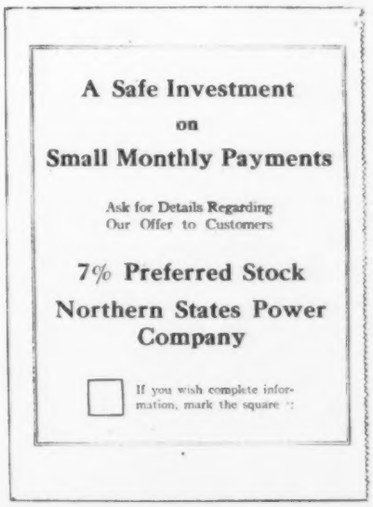
Address .....

A RETURN POST-CARD THAT WAS INCLOSED WITH EVERY LETTER SENT OUT IN THE CAMPAIGN

to buy and the leaven of such individual ownership has done its work in the community! Should there come another issue of securities, of an attractive character, backed by energetic sales and advertising methods, it will be found that among these cities served by the Northern States Power Company there is a ready and receptive market waiting to provide the funds.

THE MANAGERS ENTHUSIASTIC

For the good influence of the sales that have been made in this present campaign has been both conspicuous and spectacular. Case after case has been observed where the man or woman who has purchased stock has been so impressed with the information gained about the local company that a new friend has been made. "Last month," says an official of the company, "I visited every one of the Northern States properties on



A Safe Investment
on
Small Monthly Payments

Ask for Details Regarding
Our Offer to Customers

7% Preferred Stock
Northern States Power Company

☐ If you wish complete information, mark the square ☐

THIS ADVERTISEMENT APPEARS ON THE BACK OF THE CASHIER'S STUB ON THE MONTHLY BILLS SENT OUT BY THE COMPANIES SELLING STOCK

matters having nothing to do with the sale of stock, but incidentally I found every manager enthusiastic over his experience and emphatic in declaring that the plan has 'made a hit with the people.' I made an effort to find out whether it had been the subject of derision or uncomplimentary remarks. I was unable to learn of a single instance of this sort. On the contrary, I found

that hundreds of people had taken occasion to tell the managers that they thought the company was doing something of great importance and value both for itself and for the public. I found that it had been the subject of many conversations in hotel lobbies, at the clubs, in the smoking compartments of railroad trains, in brief, wherever men gather and exchange ideas, and that the general note was one of praise for the company broad-minded enough to encourage local proprietorship. Other interesting incidents have been reported by the individual salesmen who have been engaged in the actual selling of this stock."

INCIDENTS OF THE CAMPAIGN

In the first place, a great many of the purchasers have been women. They as well as the men purchasers are from all walks of life. There is one woman, for instance, who comes in and buys a single share of stock every now and then with money received from the writing of scenarios for motion-picture companies, and it seems that the sale of a scenario is usually followed by the purchase of a share of stock. Again, one of the leading business men of St. Paul made a liberal purchase after having carefully and personally inspected the properties of the company in the immediate vicinity. He looked over the water-power and steam plants simply as a guest and with no intimation that he wished to invest, but later he called for a salesman, stating that he understood it was the desire of the company to have a substantial local interest in its affairs, and that this was the principal reason for the placing of this order. After the shares were delivered to him, subsequent orders were placed for a number of the members of his family, including a relative in the East. There is little doubt of the future interest of this family in the organization.

The managers and salesmen, of course, encounter prospective purchasers of every type and description. One business man made a ten-day rigid investigation of the company and its securities through a New York financial representative. He then obtained all possible local information, personally grilling representatives of the company on a number of occasions, and winding up by making a substantial purchase of the stock. But the salesmen have commented frequently upon the highly complimentary remarks which have been made to them regarding the policy of the company, and they are a unit in saying that the effort has cemented the interest of the customers in the company itself. Instances where the investment by one member of the family has been followed by orders from other members of the family are frequent.

AN EMBARRASSING EVENING SALE

In order to meet and sell to the people who have expressed an interest in the stock, it has been often necessary for representatives to make appointments at odd hours and very frequently to call upon the "prospect" in the evening. One instance is recorded where the family withdrew several hundred dollars from a postal savings bank and paid for its stock at the conclusion of an evening's call, and the company's representative came down town with his pockets literally stuffed with currency. He was somewhat worried as to making a safe delivery of the money, but finally deposited it in the safe of the leading hotel until the following morning. He felt quite sure that the father and daughter who thus paid for their stock in currency invested their entire savings therein. It is only one of the many cases where wage-earners have demonstrated their confidence in the company and its securities, and, needless to say, the responsibility involved was keenly appreciated by the organization.

It often requires a great deal of patience on the part of the person selling the stock to explain carefully the whole proposition to the prospective buyer, inasmuch as many of the "prospects" are entirely without knowledge as to the fundamental principles of investing. One salesman remarked that in a number of cases he fully believed that "the prospects did not know the difference between a stock certificate and a newspaper," while, on the other hand, a great many people have had to be satisfied on a great many points of information. This particular man thinks that most of the investors act upon a general confidence in the company, the character of its management, the apparent stability of the property, and their conception of the future of the public utility as an institution. It has also been necessary from time to time for the salesmen to call upon the lawyers representing people who thought that they would like to buy the stock, and it was frequently found that these advisers themselves were incompetent to pass judgment upon the merits of the investment. Painstaking work in situations of this kind often leads to a double sale.

HOW A SOCIALIST WAS CONVERTED

One citizen who purchased ten shares of stock in one city had previously been considered quite a severe critic of the electric-lighting and motor-service rates, and on one occasion he had had a controversy with the manager regarding the manner in which service should be rendered. Nevertheless, he made inquiry regarding the stock and made an investment, and since that time his entire attitude toward the company and its affairs has changed.

Again, one of the managers was greatly surprised one day to receive an inquiry from the most prominent socialist in the community, who stopped him on the street and asked the manager if he would have any objection to giving him a copy of the company's last annual report. Annual reports of the Northern States Power Company, by the way, are very complete documents, comprising about fifty printed pages. Much to the socialist's surprise, the manager said that he not only had no objection to sending him a report, but that he would be glad indeed to have him make a careful investigation of the affairs of the local company and, if he cared to, become a stockholder. After carefully going through the annual report and the statement of earnings, this man announced that he would shortly have $1,000 to invest and that he would certainly place it in the stock of this company. He furthermore volunteered the opinion that this very policy of the company would accomplish more to prevent injury from critical agitation than anything else which it could do.

OTHER ODD EXPERIENCES

In another city, immediately after the announcement of the partial-payment plan was made to the public, the company received an inquiry from a hard-working citizen quite prominent in an outlying community composed mostly of foreigners. This man said that he had been instrumental in inducing the company to extend its service to his neighborhood; that he had been the first customer for electricity "signed up" there, and that he intended to have the honor of being the first purchaser of stock on the partial-payment plan. He took three shares for his wife. Also around the holidays there were quite a number of purchases of stock to be given for Christmas and New Year's presents, and other cases of similar investment of funds received as Christmas presents.

Another incident was where a certain railroad man, who purchased twenty shares of stock for himself and ten for his son, became interested in the stock on hearing four traveling men discuss it while riding on a

train. In short, the sales were made to every class of purchasers, and up to the first of the year there has been only one instance where stock purchased either on the cash or partial payment plan has been re-sold. This was seven shares sold to a woman who wished to raise funds on account of sickness in the family. She resold three shares, retaining the remainer.

Such is the story. Obviously the idea has appealed immediately to the public, and this has brought a degree of success to the campaign that is surprising when you consider that it was stock in a holding company that was sold and not securities of the better-known local utility. For, though several central stations have made successful sales of securities to their own local consumers, in this case the plan was carried further, and its success gives a greater evidence of the willingness of the public to become identified with utility companies known to them. The beneficent influence of this closer relationship between the company and its consumers has certainly been demonstrated effectively.

Electricity in Rebuilt Salem

The Part of the Electric Lighting Company in Bringing About the Recovery of the Massachusetts City from the Fifteen-Million-Dollar Fire of Twenty Months Ago

AT a recent convention of central-station properties managed by Charles H. Tenney & Company of Boston, Mass., S. Fred Smith, the general manager of the Salem (Mass.) Electric Lighting Company, read a striking paper upon the part the local central station has played in the recovery of the city of Salem from the fifteen-million-dollar conflagration of June 25, 1914. During the thirteen hours in which the flames raged unconquered real and personal property was destroyed at the rate of nearly $20,000 a minute, nearly 100 streets were wholly or partly wiped out, 1800 buildings were destroyed, including forty-one factories and 400 places of business, and 15,000 persons were burned out. Up to Jan. 1, 1916, there had been restored 468 buildings, 986 tenements and 11 factories, and many others are under construction. The reconstruction of the city has materially changed the business centers, and the company now finds its own property surrounded with a high class of brick structures and in the midst of a growing commercial center where there are water facilities second to none in the city.

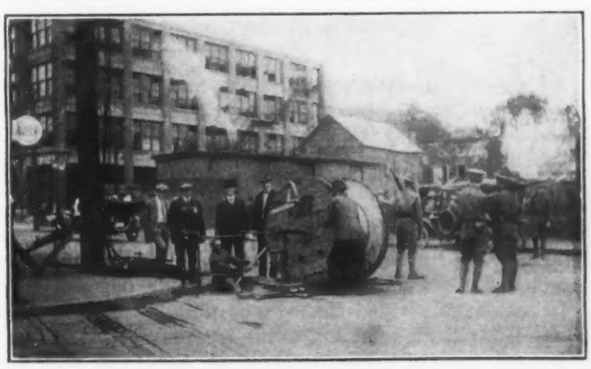
Owing to the complete destruction of the Naumkeag Steam Cotton Mills, adjoining the company's property, to which the Salem plant had been supplying electricity for power and lighting to a considerable extent for a number of years, the textile company was compelled entirely to rebuild its mills. When the question of power was reached, a contract covering a long term of years was made with the central station, this agreement being one of the most important ever negotiated by the Tenney properties. To carry it out a new 6250-kw. horizontal turbo-generator with condensing equipment has been added, with four new 750-hp. Bigelow-Hornsby boilers, forced-draft and induced-draft fans and engines, economizers, superheaters, a large steel stack and a new switchboard. New floor grades have been established, to which levels the older parts of the station will be raised whenever future improvements necessitate the replacement of machinery. Additional provision has also been made for the comfort of station employees. This work has been carried on at the station, which passed through the fire virtually unharmed, without serious interruption of service. Elsewhere in Salem new business has been obtained, and to-day the company has more customers on its lines with a larger output than ever before.

ALL THAT WAS LEFT OF THE REELS OF CABLE STORED READY FOR DRAWING INTO A NEW UNDERGROUND SYSTEM AT THE TIME OF THE FIRE.

These coils were incased in the usual wooden reels, which were entirely consumed. The bright mass at the left is lead melted from the cable sheaths.

In the fire the company lost 702 meters, including 624 in lighting and 78 in power service. Up to Jan. 1 last 2551 lighting and 98 power meters had been installed. The fire destroyed the premises of sixty-four power consumers using 2322.5 hp. of central-station service, and in addition a tie line to the local plant of the Bay State Street Railway was destroyed, entailing the loss of 700 hp. until such time as the line could be re-established; so that the total loss was 3022 hp. On Jan. 1, 1916, a net gain of 6392 hp. had been installed, making the total horsepower installed on that date 9513.

Workmen were on the ground at the time of the fire preparing to start drawing in an extensive underground



DRAWING IN NEW UNDERGROUND CABLE WHILE THE CITY WAS STILL UNDER MARTIAL LAW. NEARLY 40 MILES OF CABLE HAVE SINCE BEEN INSTALLED

A TYPE OF THE SPLENDID NEW FACTORY BUILDINGS IN REBUILT SALEM, USING CENTRAL-STATION SERVICE—THE NAUMKEAG STEAM COTTON COMPANY

system the following week in every direction from the station; but as all the material for this work was destroyed in the conflagration, it was necessary to reorder it and, with the necessary changes in lay-out, a delay of nearly a year resulted. Reconstruction of the entire outdoor system of lighting and power mains was necessary in addition to a rearranged street-lighting system. As there could be no preatranged plan of secondary wiring because of the neighborhood's changing in character of load, services had to be run as each building was completed. New pole arrangements were entered into with other public service companies whose poles and wires occupied the same streets. This opportunity lent itself very satisfactorily to simplifying what were before complex overhead wiring conditions, much to the benefit of the appearance of the streets and the maintenance of improved service with less liability to interruption. The rebuilding of the outside lines has necessitated the setting of 341 poles, over 50 miles of wire, 100 new overhead and 18 large underground transformers. Nearly 200,000 ft. of cable has been drawn into the ducts, 1168 buildings have been connected overhead, and the number of customers on the books has increased from 3560 on the day of the fire to 4245 Jan. 1.

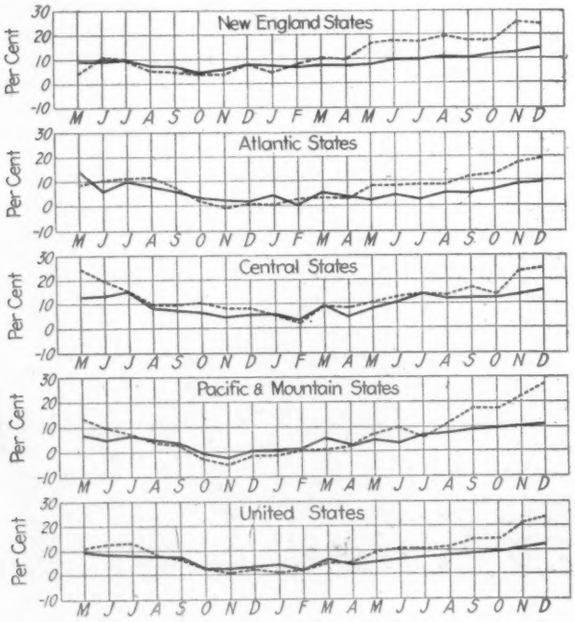
This central station has found itself in a position to be of great service to the community by being able to meet any and all demands for electricity, has proved itself one of the city's most progressive and substantial institutions, and has obtained the full confidence of the public. Every detail of this great task has been planned with forethought and precision, and this has built up for the organization a striking reputation for dependability, courage and accomplishment.

Review of 1915 Central-Station Operating Results

Year That Began Poorly Closes with Record Earnings and Output—Figures for Earnings and Kilowatt-hour Production in All Sections of the Country

THE year 1915 closed auspiciously for the light and power industry of the United States. In January, 1915, the earnings were larger than those of the previous January by 4.1 per cent, which figure fell to 2 per cent in February, and the January output had increased since that of twelve months previous by but 1.4 per cent. In this fashion was the year opened. For the month of December, however, the increase in earnings amounted to 11.8 per cent and in output to 23.0 per cent. Never were these percentages so large as at the close of 1915. Under normal conditions the percentage increase in income was a little less than 10 per cent and in output was in the neighborhood of 13 per cent.

As was estimated in the Jan. 1 issue of the ELECTRICAL WORLD, the 1915 earnings for the industry totaled $360,000,000, which is $24,000,000 greater than the 1914 earnings. The Jan. 1 estimate of the 1915 output also remains correct, namely, 18,400,000,000 kw.-hr., an increase of 1,800,000,000 kw.-hr. over the figures recorded for 1914.



FIGS 1 TO 5—CENTRAL-STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT

To the different sections of the country these $360,000,000 earnings are accredited as follows: To the New England States, 12 per cent, or $43,000,000; to the Atlantic States, 40 per cent, or $145,000,000; to the Central States, 33 per cent, or $120,000,000, and to the Pacific and Mountain States, 15 per cent, or $52,000,000. The $24,000,000 increase in earnings is accredited as follows: To the New England States, 17 per cent, or $4,000,000; to the Atlantic States, 25 per cent, or $6,000,000; to the Central States, 46 per cent, or $11,000,000, and to the Pacific and Mountain States, 12 per cent, or $3,000,000.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1915	1914	Per Cent Increase	1915	1914	Per Cent Increase
Jan..	65	$21,582,547	$20,697,423	4.1	980,085,036	966,200,323	1.4
Feb..	63	19,395,518	19,023,107	2.0	853,817,221	835,288,039	2.2
Mar..	64	18,654,443	17,529,054	6.4	939,117,179	896,903,968	4.8
April	65	18,406,412	17,675,784	4.2	900,536,022	859,235,144	4.8
May.	65	17,644,205	16,764,546	5.3	920,895,324	842,386,583	9.3
June.	65	17,603,614	16,476,255	6.9	925,067,308	836,292,076	10.6
July.	64	18,488,793	17,200,827	7.5	971,699,054	880,768,487	10.4
Aug..	64	17,342,796	16,024,893	8.2	951,752,053	853,381,696	11.3
Sept..	65	18,547,170	17,074,927	8.6	1,003,606,094	871,573,412	15.1
Oct..	65	20,112,813	18,329,490	9.8	1,087,786,658	949,288,459	14.7
Nov..	65	21,789,732	19,641,624	11.0	1,139,307,545	939,711,387	21.3
Dec..	59	21,396,688	19,156,127	11.8	1,103,046,962	895,974,975	23.0

The output for 1915 and the gain in output were divided as follows: New England States, 1,500,000,000 kw.-hr., a gain of 200,000,000 kw.-hr.; Atlantic States, 6,500,000,000 kw.-hr., a gain of 700,000,000 kw.-hr.; Central States, 6,000,000,000 kw.-hr., a gain of 550,000,000 kw.-hr., and the Pacific and Mountain States, 4,000,000,000 kw.-hr., a gain of 350,000,000 kw.-hr.

That large strides were made during 1915 in industrial activity is evident from a study of the accompanying figures. The growth in earnings was from the low value of 2 per cent in February to the high value of 11.8 per cent in December. At the same time, the growth in output was from an equally low figure of

about 2 per cent to 23 per cent. The greatest increase, therefore, has been in the demand for energy at a price considerably below the average price—to be brief, energy for industrial power purposes.

In different sections the start of this industrial activity was at different times. It came early in New England, as these figures show, along about February.

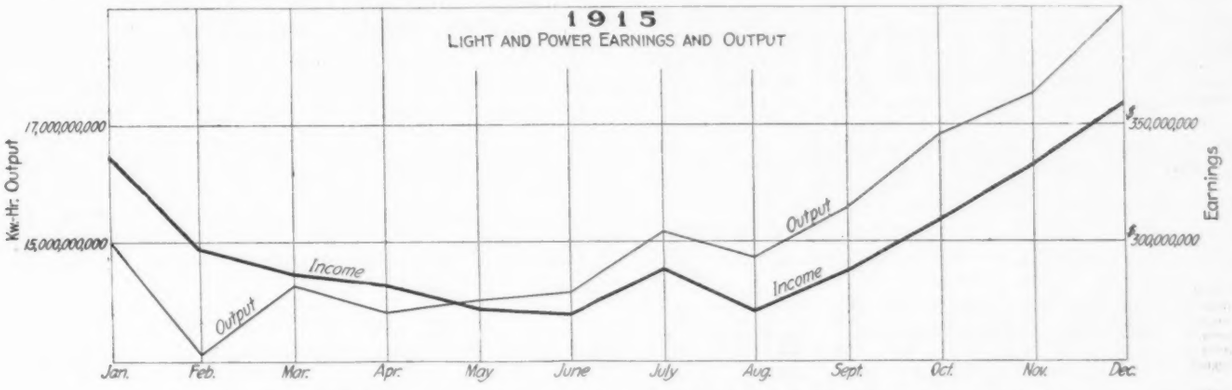


FIG. 6—TOTAL MONTHLY EARNINGS AND OUTPUT FOR CENTRAL STATIONS FOR THE YEAR 1915

New England was the first to be awakened from the industrial lethargy of the nation because of its geographical position and because of the large number of mills in these States particularly adapted to the turning out of munitions of war and of manufactured supplies of almost every type and description.

A month later the Central States felt the demand for power. The rolling mills, the zinc mines, the manufacturers of machinery, etc., found that there was as brilliant a prospect for the raw materials and the necessary machinery as there was for the finished shrapnel, boot or stocking.

In May the other two sections, the East and the West, began to pick up. It was impossible for two sections of the country to be enjoying prosperity without the rest of the country sharing in it.

From then on loads have increased and have in many cases been limited only by two things, a lack of the necessary motors and a lack of the necessary generating equipment. So great has been the demand for power that the manufacturers of power apparatus have been hard put to fill the demand. It is impossible to get apparatus on quick delivery. The volume of buying in power apparatus from boiler to motor is greater now than it ever was before. In almost every case central-station service, primarily because of its quickness of connection, has been resorted to. A sure supply with the quickest possible installation was necessary.

To war orders alone, however, cannot be credited all of the nation's industrial activities. The year 1915 saw the readjustment of the export trade of the United States. Again products of American manufacture began to find their way into the world's markets in volume. The United States became the banker of the world, and the American dollar mounted the throne formerly occupied by the English pound sterling. This position was brought about because the United States had what Europe and the rest of the world wanted—munitions of war, food, metals, clothing and machinery. The 1915 wheat surplus broke all records and the nation's crops were the largest ever harvested. Woolen mills were choked with orders even at greatly advanced prices. Mines all over the country were in operation, even some that were formerly closed because of the high operating expense. The steel mills were unable

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States 1915	New England States 1914	Per Cent Increase	Percentage of Industry Represented	Atlantic States 1915	Atlantic States 1914	Per Cent Increase	Percentage of Industry Represented	Central States (Illinois Excluded) 1915	Central States (Illinois Excluded) 1914	Per Cent Increase	Percentage of Industry Represented	Pacific and Mountain States 1915	Pacific and Mountain States 1914	Per Cent Increase
INCOME	January	67	$2,423,795	$2,271,881	6.8	69	$9,075,335	$8,695,593	4.4	57	$5,827,997	$5,525,579	5.4	88	$3,960,608	$3,917,371	1.0
	February	67	2,246,794	2,134,341	5.4	69	8,037,878	7,968,625	0.9	55	5,296,786	5,148,439	3.0	85	3,576,432	3,534,864	1.2
	March	67	2,146,032	1,999,326	7.5	69	7,777,126	7,419,808	5.2	55	4,885,384	4,465,728	9.5	88	3,605,893	3,412,842	5.8
	April	67	2,109,767	1,976,473	6.8	69	7,510,810	7,241,164	3.9	57	5,003,673	4,773,949	4.8	88	3,475,740	3,366,830	3.2
	May	67	2,035,680	1,887,606	7.9	69	7,100,334	6,912,581	2.6	57	4,946,907	4,577,818	8.1	88	3,383,749	3,233,989	4.8
	June	67	2,063,423	1,874,575	10.2	69	6,945,986	6,628,523	4.8	57	4,993,410	4,492,411	11.2	88	3,409,738	3,281,696	3.9
	July	66	2,020,513	1,835,968	10.2	68	6,710,217	6,519,442	2.9	56	4,801,699	4,211,641	13.9	88	3,539,168	3,317,713	6.8
	August	63	2,057,635	1,855,140	11.0	68	6,853,118	6,511,307	5.3	56	4,749,082	4,231,322	12.2	88	3,545,454	3,288,729	7.8
	September	66	2,162,064	1,949,663	11.0	68	7,288,842	6,904,245	5.5	57	5,285,358	4,691,751	12.6	88	3,664,215	3,387,717	8.2
	October	66	2,327,214	2,073,059	12.3	68	8,096,982	7,550,808	7.2	57	5,820,653	5,153,314	13.0	88	3,798,012	3,477,051	9.3
	November	66	2,472,539	2,188,049	13.0	67	8,894,805	8,158,589	9.0	56	6,244,275	5,482,185	13.9	88	4,058,986	3,696,557	9.8
	December	59	2,635,610	2,304,555	14.2	66	8,920,936	8,159,410	9.3	54	6,528,989	5,655,363	15.5	76	3,228,634	2,933,438	1.02
KW.-HR. OUTPUT	January	67	72,550,608	69,317,803	4.7	69	374,972,536	373,336,906	0.7	57	272,623,760	258,572,903	5.5	88	252,531,483	256,198,272	1.4*
	February	67	66,600,132	61,515,979	8.3	69	312,443,505	305,307,260	2.4	55	238,938,034	232,520,476	2.7	85	229,865,568	229,185,967	0.3
	March	67	72,121,319	65,343,335	10.5	69	346,341,496	335,506,429	3.3	55	257,136,231	235,656,647	9.2	88	255,529,704	253,423,951	1.0
	April	67	68,475,232	62,442,110	9.7	69	320,142,323	311,476,008	3.0	57	257,967,434	237,673,326	8.5	88	246,287,781	239,661,364	2.8
	May	67	68,823,914	61,060,621	12.9	69	326,191,569	301,440,779	8.1	57	262,885,043	236,154,464	11.2	88	254,586,394	236,082,868	7.8
	June	67	71,566,127	60,972 379	17.4	69	318,245,370	293,751,083	8.5	57	265,930,311	234,286,440	13.2	88	261,083,835	237,843,021	9.8
	July	66	71,025,184	60,755,381	17.0	68	320,371,761	293,909,832	9.0	56	264,498,989	232,541,585	13.9	88	274,488,334	258,475,004	6.3
	August	63	71,954,506	60,870,433	18.5	68	329,947,721	302,960,234	8.9	56	272,508,518	240,423,753	13.4	88	276,631,551	248,463,980	11.3
	September	66	74,835,203	63,716,224	17.3	68	358,765,971	319,549,780	12.3	57	286,893,057	247,046,941	16.1	88	279,133,989	237,795,633	17.5
	October	66	82,568,951	69,882,867	18.3	68	400,516,741	353,685,472	13.3	57	305,962,017	268,972,416	13.7	88	292,885,623	251,095,356	16.8
	November	66	87,193,883	69,359,620	25.8	67	420,584,253	355,151,259	18.5	56	322,271,858	259,938,432	24.0	88	301,667,927	248,852,443	21.3
	December	59	88,070,420	70,636,543	24.8	66	429,363,026	359,365,505	19.6	54	332,307,411	267,087,386	24.6	76	245,799,076	192,656,317	27.6

*Decrease.

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
INCOME:									
Group 1....	3.8	4.8	6.5	5.3	7.2	7.3	8.7	9.7	10.3
Group 2....	5.0	6.2	2.8	8.8	9.1	10.0	11.4	12.8	14.4
Group 3....	5.5	5.8	10.1	9.7	14.5	15.4	23.4	18.0	19.7
Group 4....	3.9	7.1	6.9	8.2	8.0	9.0	8.7	11.9	13.1
Group 5....	1.9	5.5	4.7	8.5	7.5	11.9	5.7	11.5	11.2
OUTPUT:									
Group 1....	5.4	7.2	10.1	11.1	9.7	12.2	10.7	16.8	20.3
Group 2....	11.2	13.1	9.1	18.1	19.0	18.9	21.4	29.0	33.8
Group 3....	1.2*	6.1	11.2	4.5	13.0	24.0	27.3	36.0	34.0
Group 4....	3.0	29.1	6.0	12.5	10.9	11.3	13.4	18.0	15.6
Group 5....	5.9	15.5	14.8	20.5	12.7	19.3	1.7	13.0	9.8

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
INCOME:									
Group 1....	6.3	9.4	11.6	11.2	11.0	10.6	12.7	13.8	14.8
Group 2....	4.04	7.5	7.0	7.0	9.6	10.3	12.6	12.7	16.1
Group 3....	20.6	8.9	21.8	10.2	16.5	14.7	17.3	15.5	16.8
Group 4....	8.4	7.1	11.9	6.6	9.2	10.0	8.8	9.0	7.1
Group 5....	0.4*	1.0*	2.8	16.0	21.2	5.8	8.3	13.7	20.8
OUTPUT:									
Group 1....	12.7	16.0	19.0	17.2	17.2	19.2	20.8	28.7	26.2
Group 2....	12.3	19.9	20.8	26.0	26.0	21.7	18.3	30.0	26.5
Group 3....	3.2	7.0	17.9	13.5	12.3	14.4	8.7	23.0	28.1
Group 4....	12.1	6.3	17.1	7.8	13.6	9.0	20.6	20.1	11.5
Group 5....	25.5*	13.5*	1.0	11.0	15.1	8.5	1.8	51.0	30.1

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
INCOME:									
Group 1....	1.6	2.0	3.8	1.4	4.0	4.4	6.2	7.6	8.1
Group 2....	5.6	8.2	8.0	9.7	11.6	11.0	11.9	15.0	16.8
Group 3....	4.1	1.6	7.5	7.5	8.5	8.9	11.0	10.0	12.9
Group 4....	2.9	6.2	3.9	7.0	8.4	10.0	9.8	14.4	15.3
Group 5....	15.2	19.6	14.8	†	2.0*	14.3	10.9	14.6	15.2
OUTPUT:									
Group 1....	4.8	9.0	8.2	8.0	9.0	11.6	12.1	16.0	20.0
Group 2....	7.6	7.1	11.0	17.0	15.0	16.3	16.8	26.6	27.0
Group 3....	4.1*	3.2	7.2	7.5	6.4	10.4	15.8	22.1	15.7
Group 4....	1.9	22.5	7.1	13.8	13.2	12.5	14.8	22.0	18.9
Group 5....	57.2	71.5	61.8	†	11.4	13.8	2.8*	18.6	21.8

*Decrease. †Results omitted owing to insufficient returns.

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
INCOME:									
Group 1....	7.3	9.8	11.4	11.8	12.2	12.4	12.3	13.1	15.0
Group 2....	3.5	3.0	5.6	7.0	7.5	8.6	10.2	10.8	11.9
Group 3....	10.4	15.5	19.6	16.4	21.0	22.0	22.7	24.0	29.5
Group 4....	6.0	6.7	12.4	13.0	16.9	17.9	16.0	19.8	19.5
Group 5....	7.6	19.9	5.0	1.2	20.2	13.5	24.7	9.6	6.9
OUTPUT:									
Group 1....	6.8	8.4	10.8	11.8	12.2	15.2	10.4	22.3	21.2
Group 2....	12.5	9.7	13.5	11.1	9.8	9.0	14.0	21.5	28.8
Group 3....	13.1	27.0	26.1	28.9	31.0	29.3	34.2	43.0	52.1
Group 4....	7.9	10.0	15.7	18.2	26.1	29.0	33.5	36.7	17.0
Group 5....	39.7	28.8	20.4	24.9	25.1	48.0	3.0	17.3	6.0

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
INCOME:									
Group 1....	4.0	3.1	9.0	5.1	7.0	13.9	7.5	7.5	4.0
Group 2....	9.4	12.7	11.1	13.0	11.1	11.5	14.3	15.7	17.3
Group 3....	0.3*	3.4	3.6	7.9	17.1	19.7	21.4	20.0	24.6
Group 4....	3.8*	8.7	1.6*	7.8	0.2	0.3	0.1	4.3	10.8
Group 5....	2.7*	2.4*	3.3	4.5	1.7*	15.0	3.1	10.9	5.4
OUTPUT:									
Group 1....	4.5	2.3	10.8	6.2	6.3	8.4	7.1	9.9	12.5
Group 2....	11.6	19.0	14.9	27.5	39.3	40.3	41.3	51.0	56.0
Group 3....	3.5*	3.8	12.4	8.4*	18.5	49.2	52.4	67.0	67.0
Group 4....	4.7*	87.0	4.5*	11.8	0.2	4.1	1.5	6.2	10.5
Group 5....	9.6	18.5	3.6	10.9	8.0	21.0	3.5	7.5	0.1

*Decrease.

to supply the demand and were sold out for more than a year in advance. Machinery manufacturers were in the same condition. After many years the railroads again forged ahead. Where formerly they were frightened by a large surplus of idle rolling stock, it was now the reverse and embargoes were placed on certain goods. The year 1915 was a typical March in the calendar of the nation's industries. "It came in like a lamb and went out like a lion."

Curves of Percentage Increase

The curves in Figs. 1 to 5 show graphically the percentage increases in Tables I and II. The remaining tables give the percentage increases for companies grouped according to size. Group 1 is based on returns from companies operating in cities having a population of over 100,000 inhabitants. Group 2 includes cities having between 50,000 and 100,000 inhabitants; group 3, between 25,000 and 50,000; group 4, between 10,000 and 25,000, and group 5, between 5000 and 10,000.

Electric Cooking in a British Railway Restaurant

Details of the Equipment of the Euston Station of the London & North Western Railway

The elaborate electric-cooking equipment installed in the Euston station of the London & North Western Railway has attracted wide attention in electrical and other circles in England, where press commentators foresee a future general application of electric heat to the problems of the restaurant kitchen. An illustrated article in a recent issue of the London *Electrician* gives the following information concerning the Euston installation.

The electric kitchen is situated in the basement and contains a large boiling table, which is equipped with twenty-three boiling plates. Of these seven are 12 in. loaded to 2000 watts, eight are 10 in. loaded to 1500 watts, and the remainder are 8 in. loaded to 1200 watts. Each plate is controlled by a rotary switch giving full, medium and low heats, the ratios being 1:½:¼, and each is provided with a fuse and pilot lamp. The switches, fuses and lamps are fitted below the edge of the table and are inclosed to prevent damage. The pilot lamps are across the full pressure of 230 volts and are protected by means of metal caps, leaving a comparatively small protected aperture through which the light can be seen. The wiring is carried in water-tight cast-iron channels and is arranged to be readily accessible.

An unusual feature consists of two large boilers. Each of these takes 7.5 kw. and is provided with three heating elements, each separately controlled, thus giving three heats. The capacity of each boiler is 30 gal. In both cases the pan is made of cast iron, with strainer and draw-off cork. The boiler is heavily lagged and cased outside with planished steel. The covers are balanced, and the top rim of the pan is provided with a water lute to prevent escape of steam. The present requirements necessitate the boiling of about twelve hams per day, and apart from this work the boilers are found to be very useful for a variety of work. Hot water for general purposes, which is obtained from a coal-heated boiler, is laid to these ham boilers and also to a potato steamer. The input to the latter is 4.5 kw. The total power used by the installation is about 130 kw. The entire feasibility of taking care of the needs of hungry travelers by electricity is shown by the fact that the total number of meals at present provided per day is about 400.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

How Plant Insurance Rate Has Been Reduced 37 per Cent in Four Years by Ohio Company

As indicative of what can be done toward the general reduction of operating costs by a persistent and definite effort toward an end, data from the insurance statistics of the Columbus (Ohio) Railway, Power & Light Company are given. In this instance Harold W. Clapp, general superintendent, set about to reduce the rates of insurance on his property, and did so by co-operating with the insurance interests in doing the things they required and by instigating a general clean-up policy throughout the organization.

Year	Rate per $1,000	Year	Rate per $1,000
1912	$7.68	1915	$5.15
1913	7.57	1916	4.85
1914	5.21		

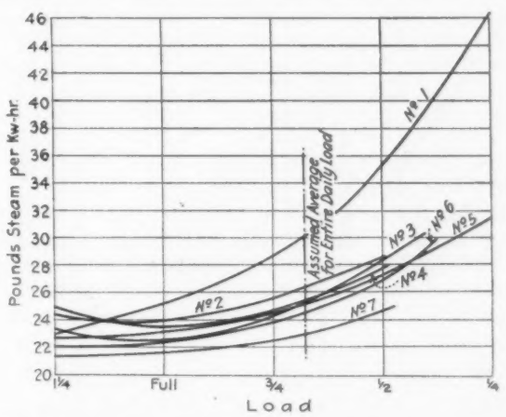
Steel lockers and fire doors were installed in place of wooden ones; skylights which were not standard were made so; fire hydrants were put in; trapdoors not properly trapped were altered; cubbyholes, oil waste and rubbish were eliminated; a large number of Pyrene fire extinguishers and fire and sand buckets were installed in the various buildings, a number of which are rather old frame structures. Moreover, the entire property undergoes, in addition to the periodical inspections of the Ohio State Inspection Bureau, frequent inspection by the company's own inspector, who goes through all the lockers and through the property generally and reports any waste or rubbish found.

The figures not only show what can be done to save premiums by pursuing a general clean-up policy, but also indicate to stockholders that good care is being taken of the property.

Analyzing Machine Performance and Coal Characteristics Before Purchasing

Economy in purchasing does not always mean securing the lowest prices, but rather obtaining the best average results for the least expenditure, declared Charles Brossmann, consulting engineer, before a recent meeting of the Indiana Engineering Society. For instance, in receiving bids on engines comparisons should be made of the guarantees by plotting them on one sheet, as shown in the accompanying chart. The unit with the lowest steam consumption at full load is not always the best, since it may be at loads above or below this that highest steam economy is desired. Therefore a vertical line should be drawn through the abscissa representing the average load during this operating period and the difference in steam consumptions compared at this load.

By multiplying this difference in steam economy by the evaporation ratio of the boiler, the number of kilowatt-hours of energy generated per year and the cost of coal per ton, the annual difference in fuel expense



MACHINE-PERFORMANCE CURVES ARRANGED FOR COMPARISON

can be estimated. Not only should this be considered in determining which unit to purchase, but an investigation should also be made to determine whether or not the increased unit steam consumption will necessitate providing additional boiler equipment. The sum of the difference in fuel bills and amount which might have to be expended for additional steaming equipment should serve as a guide to how much can be economically paid for the unit with the better steam-economy curve.

Similar analysis should be made of coal characteristics. For example, computations should be made to determine the loss in heating value due to moisture content and the addition in price per ton due to ash loss, so that the actual B.t.u.'s which will not be carried away by moisture and ash can be ascertained and the number

METHOD OF COMPARING PLANT VALUES OF COAL

Proposition	Price per Ton	Fixed Characteristics per Pound						Loss Due to Moisture in B.t.u.	Actual B.t.u. per Pound, Allowing for Moisture	Addition in Price per Ton Due to Ash Loss	Actual Cost of Coal Due to Ash Loss	Actual B.t.u. per Ton	Number B.t.u. for 1 Cent	Number B.t.u. for $1
		B.t.u.	Fixed Carbon, per Cent	Volatile Matter, per Cent	Ash, per Cent	Sulphur, per Cent	Moisture, per Cent							
1	$1.80	12,000	44.64	37.70	8.61	1.35	9.05	1086	10,914	$0.0430	$1.8430	21,828,000	118,284	11,828,400
2	1.75	11,800	45.75	34.40	10.20	3.16	9.65	1138	10,662	0.0510	1.8010	21,324,000	118,000	11,800,000
3	2.30	14,700	57.00	35.15	6.00	0.60	1.25	184	14,516	0.0300	2.3300	23,032,000	124,600	12,460,000
4	1.80	13,596	52.26	36.40	6.69	0.64	4.01	545	13,051	0.0334	1.8334	26,102,000	142,478	14,247,800
5	1.75	13,110	44.63	37.20	7.89	2.80	10.28	1348	11,762	0.0394	1.8394	23,524,000	127,889	12,788,900
6	2.45	13,600	59.00	33.00	8.00	0.75	0.10	136	13,464	0.0400	2.4900	26,928,000	108,144	10,814,400

of useful B.t.u.'s obtainable for $1 can be computed. In conjunction with this a study should be made of the cost of handling ashes so that this expense can be prorated on the different grades of coals according to their ash content. The nature of impurities in ash having a direct effect on clinkering should also have some weight in valuing coals. Some of the items taken into consideration by Mr. Brossmann in valuing different grades of coal are indicated in the accompanying table. Of the two lowest-priced coals listed one is good as to heat units, but both have high sulphur, moisture and ash content. Still, both coals cost $1.75 a ton. Again, there are two other coals, each costing $1.80 a ton, one with a heating value of 14,000,000 heat units for $1 and the other with only 11,600,000 heat units for $1. These cases serve to show that heat content per pound of fuel should not always be used as a purchasing standard.

Arc Lamps Show Low-Outage Record at Detroit

The twentieth annual report covering the operation of the public lighting plant of Detroit contains the statement that the city's 4-amp. arc-lighting system operated a total of 29,207,855 lamp-hours during the year and showed a total outage of 30,649 lamp-hours, or about one-tenth of 1 per cent. The report shows further that the net operating cost per arc lamp per year for 1915 was $24.28, as against $25.21 for 1914. The reduction in cost per lamp of 93 cents, the report states, was not made at the expense of plant maintenance, since $2,397.82 was spent for maintenance of building, $7,541.22 for maintenance of steam plant, $3,860.33 for maintenance of electric plant, $4,131.05 for maintenance of tools and machinery, $6,868.32 for maintenance of arc lamps and switches, $29,138.08 for maintenance of overhead lines and underground cables, etc.

This report covers the year ended June 30, 1915, and at that time the city was lighting 754.44 miles of streets with 8193 arc lamps, an average of 9.88 lamps per mile of street. In 1914 the city had but 9.44 lamps per mile of street. The reason for showing just the cash operating cost of the lamps instead of total costs is best given by the following paragraph from the report:

"One endeavor [securing funds for a valuation] in which this commission has repeatedly failed is again referred for serious consideration. Our books show the present investment in the public lighting plant to be $2,598,467.04. How near does this come to the actual present worth of the public lighting system? To the best of our ability we have endeavored to keep accurate records. But now, after twenty years' operation of the plant, it would seem to be a good business proposition to get an inventory of the entire system to determine what has been the actual cost of the street lighting for this period. Since 1908 this commission has not attempted to show the actual cost but has reported cash expenditures only. No attempt has been made to show depreciation charges, for the reason that no precise information upon this subject is available and that none will be available until an inventory of the entire system has been obtained. It would be absurd to continue to pretend to show the true cost when the data upon which this is based are based upon an assumption. It is safe to state that there is not a private enterprise doing business in the city of Detroit with an annual expenditure approximating that of the public lighting plant that would continue for a period of twenty years without an inventory. In the estimates to be submitted for the year ending June 30, 1917, this commission will therefore again insert an item for an inventory."

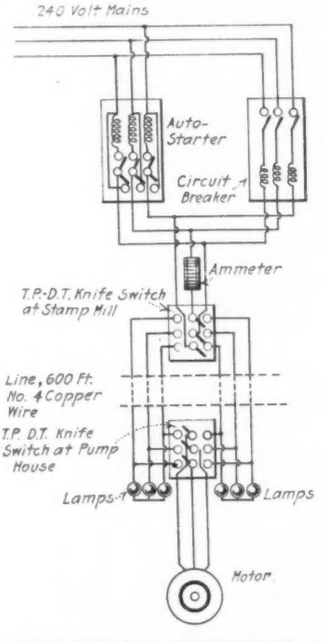
Change from Twelve-Hour to Eight-Hour Shifts Results in Saving per Fireman of 60 Cents a Day

At the recent conference of station-operating men of the Ohio Electric Light Association experience in changing from twelve-hour shifts to eight-hour shifts in boiler-room operation was solicited. One operator reported that under twelve-hour-shift operation his company usually employed thirty new firemen a month regularly, or one new fireman a day. When the company changed over to an eight-hour shift not only was the work better done but it was possible to hold the men, and the company now has an application waiting list. A better class of men is secured, and the cost of firing is from 3 cents to 5 cents less per ton of coal than on the twelve-hour shift. He said that each fireman now handles an average of between 12 tons and 15 tons of coal a day delivered on the firing floor. The men are satisfied with the working conditions, and the company secures a better performance of boiler-room equipment than was previously possible.

How a Pump Motor at a Mine Is Controlled from Two Points

BY F. MAURY GILLESPIE

At the reduction works of a mining company it was necessary to arrange the service circuits of a motor driving a 7-in. by 10-in. triplex pump so that the set could be started or stopped from either of two places, one at the pump and the other at the stamp mill about 600 ft. away. It was also important that the pump start against the head caused by the discharge pipe being partly filled, since it would be inconvenient to send a



CIRCUITS AND APPARATUS FOR CONTROLLING A MOTOR FROM TWO POINTS

man down to the pump house to drain the discharge pipe every time that it was desired to place the pump in operation.

The pump operates against a head of approximately 250 ft. and is driven by a General Electric phase-wound, three-phase induction motor rated at 20 hp., 220 volts, at 900 r.p.m. The starting resistance in the secondary

circuit is mounted inside the rotor and operated by a rod projecting through the shaft.

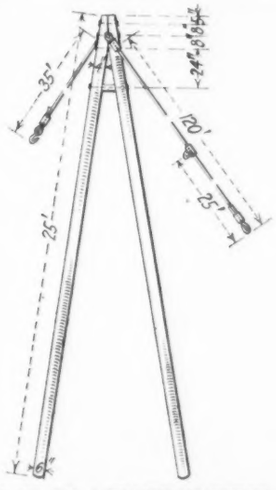
The circuit connections are shown in the accompanying diagram. The instructions for operating the motor at the pump house are as follows: To start the motor, pull out the rod in the shaft of the motor, throw in the switch on the side where lamps are glowing, and push in the rod in shaft of motor. To stop the motor, throw the switch over to the opposite side. Do not pull out rod in motor shaft and do not leave the switch in open position except when working on the pump or motor.

For operating the pump from the stamp mill the following instructions are given: To start the motor, open the automatic switch, throw knife switch to opposite side, throw auto-starter into circuit, close the automatic switch, and cut auto-starter out of circuit. To stop the motor, throw knife switch to opposite side. Do not leave switch in open position and do not leave automatic switch open.

With this arrangement the pump may be started or stopped from either of the two places independently. When starting with the auto-starter, the pressure in the pipe line is reduced by means of an escape valve installed near the switchboard, which makes it possible to reduce the head from 250 ft. to about 150 ft.

An Easily Made A-Frame for Handling Large Line Poles

The accompanying illustration shows a design of gin pole that was employed in constructing a heavy telephone toll line through West Virginia where the route was strewn with rocks and therefore unsuitable as a footing for pole erection with pike poles. It was made of two 25-ft. oak poles with 6-in. butts and heads miter-joined by three bolts 8 in. apart. About 4 ft. below the peak a spacing block which separated the legs about 8 ft. at the butts was secured with a through bolt. In assembling the frame the middle link of a heavy three-link chain was placed between the heads, and the second bolt from the peak passed through it, thus leaving one free link hanging on each side of the frame. To one



CONSTRUCTION OF AN A-FRAME TO ERECT HEAVY POLES

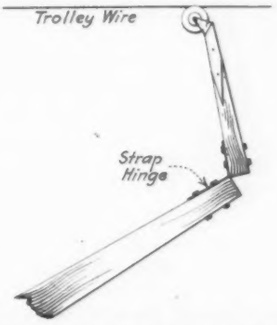
of these free links was attached a 35-ft., 6600-lb. stranded steel cable with a hook on one end. To the other link was attached a 120-ft. stranded cable of similar strength with a loop in one end and another at 25 ft. from the end.

In erecting a pole tackle blocks were attached to the nearest set pole (or any firm anchor), and the new pole was laid with its butt at the hole and its top directly away from the anchorage. Then the A-frame was set just back of the hole, the long strand attached to the anchored block, and the free end of the short cable wrapped around the head end of the pole to be raised and hooked around the taut section. To prevent the pole swaying while it was being raised or being carried past the vertical position side guys were attached to the pole. The tackle attached to the A-frame raising cable was hauled in by a team of horses. The A-frame was developed by W. A. Soyez of the Chesapeake & Potomac Telephone Company.

A Mine Locomotive Trolley That Prevents Trouble When Running Backward

BY R. H. RICHARDS

When a mine locomotive with an ordinary inclined trolley pole is run backward without reversing the current collector, trouble sometimes results owing to the collector jumping off the trolley wire, especially at frog crossings, and becoming entangled in the wires, thereby possibly breaking them or itself. At the Anaconda Mines, Butte, Mont., this has been prevented by using a



A TROLLEY-POLE CONSTRUCTION FOR MINE LOCOMOTIVES

trolley pole which will fold back on itself if it strikes an obstruction when running in the reverse of normal direction. As shown in the accompanying drawing, the pole is made in two sections of about equal lengths jointed at the middle on the upper edge by a strap hinge.

Safety-First Precautions When Inserting Cartridge Fuses

BY T. H. REARDON

When a fuse fails on account of an overload condition, another fuse inserted in its place may endure for the time limit without blowing. If, however, the fuse failed on account of a short-circuit condition, the new fuse when inserted will blow immediately and with violence of explosion. It is essential therefore that certain precautions be observed when inserting fuses to avoid injury to operators. One such precaution when the condition of the circuit is doubtful consists in bridging the cut-out with a lamp bank adapted to the voltage on the system. If the lamps are lighted, it shows that the circuit is closed, but does not indicate the amount of resistance through which it is closed, which may be anything between normal and short-circuit. Evidence that a circuit is complete when it should be open is a warning to an operator that he should protect his face and hands against the effects of a flash.

A second safety measure is to work with sleeves down and with hands covered by suitable rubber or light cotton gloves at all times when doing any kind

of live-wire work in which flashes are to be guarded against rather than dangers resulting from electric shock. It is the writer's personal experience that such measures prevent numerous severe burns as the result of flashes.

Ohio Station-Operating Men Discuss Selection of Auxiliary Equipment

At a meeting of station-operating men of the Ohio Electric Light Association in Columbus on Feb. 16 attention was called to the importance of a proper selection of auxiliary equipment to accompany a particular type of turbine unit, in order that the proper heat balance may be maintained in a station and there be no great amount of surplus exhaust steam. The advisability of minimizing the exhaust steam not needed for heating the feed water brought up the question of motor drive for auxiliary units. C. H. Spiehler, Dayton (Ohio) Power & Light Company, reported the choice of a motor-driven reciprocating pump in preference to the wet type turbine-driven for a new 7500-kw. unit, on account of the power required to drive it, and not because of the operation of the pump itself.

N. G. Reinicker, New York Edison Company, referred to the Detroit Edison Company's installation of four boiler-feed pumps in the Delray station, of which three are steam-driven and one electric. The electrically driven pump is used during light-load periods and makes possible the maintenance of the heat balance. The drive for the auxiliary must be selected with this aim in view, he pointed out, so as to make possible that combination of steam and electric drive which will come nearest to providing the maximum and minimum quantity of exhaust steam required at different times of day.

At Marion, Ohio, the exhaust steam from the auxiliaries of a 750-kw. unit, when operated at full load, is all condensed in the feed-water heater, and the excess when running light is avoided by adjusting the nozzle on the circulating-pump turbine, thereby effecting quite a saving in waste steam.

Another plan mentioned was to extend the shaft on a slow-speed circulating-pump turbine and install an induction motor on it. Then on light load the pump is driven by the motor, just sufficient steam passing through the turbine to keep the blades cool. On heavy load the pump is driven by the turbine, the motor running idle without energy. In this way the simplicity of the slow-speed turbine with its freedom from gears is retained, and waste steam on light load is also saved.

There seemed to be some feeling that dependence should not be placed entirely on motor drive for auxiliaries in a station, and a question was asked as to why this feeling existed in view of the present well-known reliability of motors. The answer given was that there is a possibility of the motor being "kicked" off the line owing to a surge or short-circuit, in which case the vacuum on the system would be lost and the whole plant shut down momentarily. An instance was cited when a new steel stack being erected came into contact with a circuit extending out to a large consumer. This circuit had not been out of service for several years, and the relays were probably not so clean as they should have been. The result was that the exciter and circulating pump both tripped out and caused a complete momentary shut-down.

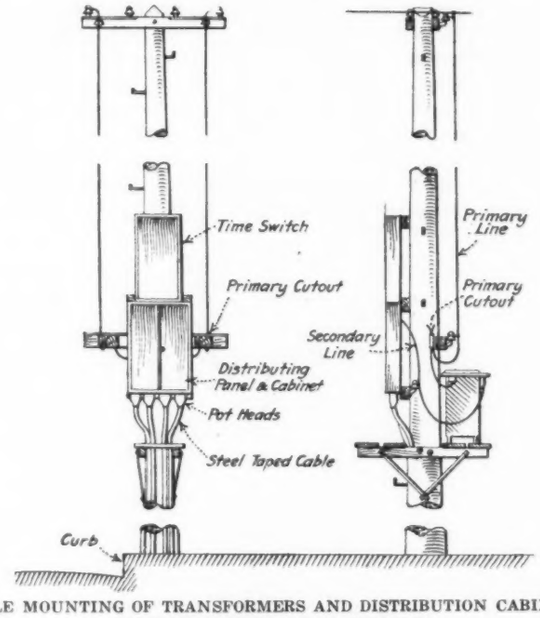
The Detroit Edison Company has taken care of such a situation, Mr. Reinicker pointed out, in the new Conners Creek station, in which all auxiliary units are motor-driven, by the installation of a separate source of power, a small turbine unit, which supplies energy to all the station motors and is entirely separate from the outside system and altogether free from outside disturbances. This, of course, would not apply to small plants.

In speaking of the proportioning of boiler sizes to generating units, there seemed to be a general tendency toward installing large-size boilers in preference to smaller boilers and more of them for a given size of station, no matter what the total rating might be. A better economy is realized both from the reduced investment, say, of three 500-hp. boilers as against five 300-hp. boilers and from better operating characteristics. William Long, Toledo Railways & Light Company, thought it was more a question of stoker and furnace considerations than those of the boiler, since the maintenance on these goes up with the forcing of the boiler, but that if the furnace is designed for the larger load, the maintenance will not increase under overload operation. Mr. Spiehler said that he had an installation of four 500-hp. boilers and three 1165-hp. boilers, the latter equipped with stokers of a different type from the former, and that the maintenance on the four 500-hp. boilers is 90 per cent of the entire maintenance.

A Terminal-Pole Construction for Multiple Street-Lamp Circuits

BY C. L. WHEELER

The type of terminal-pole construction shown in the accompanying illustration has been found satisfactory in a number of small towns where underground multiple street-lamp circuits are fed from an overhead primary system through transformers. As indicated, the overhead primary circuits are connected with the transformers by drops supported at the outer ends of cross-arms on bracket insulators. The primary cut-outs are attached to the lower cross-arm, where they are readily accessible. On the opposite side of the pole from the transformers are the distribution cabinet and a time switch controlling the lamp circuits. The secondary leads connecting with the underground lamp circuits consist of steel-taped cables attached to the bottom of the distribution cabinet by pot-heads. This construction provides a moisture-proof wire plant and permits a division of the circuits for separate fusing that localizes trouble arising in any one of them.



POLE MOUNTING OF TRANSFORMERS AND DISTRIBUTION CABINET SERVING UNDERGROUND CIRCUITS

Flood-Lighting of New Columbus (Ohio) Athletic Club from Projectors on Pole-Top Structure

Members of the Columbus (Ohio) Athletic Club are celebrating the opening of a splendid new club building, and during the first week of the club's occupancy of the structure its exterior was flood-lighted from a bank of twenty-four projectors mounted on a platform on the top of two 65-ft. poles. The club building stands on a corner plot, and its entire 92-ft. front was illuminated, in addition to a distance of about 20 ft. on the side street. Since the structure is 83 ft. high, the total surface illuminated was about 10,000 sq. ft. The poles supporting the projector lamps were erected at a distance of about 150 ft. from the building lighted. The installation consisted of twenty-four General Electric form L-1 flood-lighting projectors, equipped with 500-watt Edison Mazda clear flood-lighting lamps. Energy to operate the flood-lighting equipment was furnished by the Columbus Railway, Power & Light Company.

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

Soliciting the Contractors Instead of the Unwired Homes in Massillon, Ohio

Another angle from which to attack the field for new customers is to solicit the contractors instead of the "prospects" in unwired homes. Such was the procedure of the Massillon (Ohio) Electric & Gas Company in a recent campaign, and it proved to be a money maker for the electric company as well as the two contractors in the town.

Until recently neither of these contractors did any advertising, nor did they engage in much if any personal solicitation for business. Hence, looking at the business from the contractor's viewpoint, O. A. Acuff, new-business manager of the electric company, conceived the idea of securing new customers on its lines by this indirect solicitation of the public through the contractor. Accordingly, the two contractors were asked to meet with the central-station men every morning at 8 o'clock for a week, and in these little conferences the members acquainted one another with the different obstacles met in getting business and discussed possible methods of going after new business. As the contractors became more interested it was proposed to them that the central-station company furnish them with house-wiring advertising copy ready for publishing in the daily papers.

This arrangement was brought about, and Mr. Acuff made contracts with the newspapers for space to be paid for by the contractors, and ran a series of advertisements, of which the accompanying illustration is a sample. The "ads" brought in the desired business, the central station has a number of new customers on its lines, and the contractors both have all they can do, and incidentally feel most kindly toward the company.

You Know Just as Well as I Do

that each house wife in Massillon who does her house work, as the saying goes has her "hands full" We men demand the most modern methods in our offices and shops. If we had to do the work today as it was done a century ago we would "howl" from morning until night. But our good help mate at home what about her? Has the method changed in her case? You know whether it has or not. If it hasn't appropriate the price of two 5c cigars each day for the purpose. Only 10c a day that's a small amount isn't it. Well, that's $3.00 a month. Just think your wife can manage to light your home, sweep your floors, wash and iron all the clothes, wash the dishes, in fact do all her hard work the easy, clean, comfortable way--Electrically--for less than the price of two 5c cigars--10c--each day. That's a small amount. It could easily be saved in another way. Just think what it would mean to friend wife to be able to rest all afternoon. Should we men make such a "personal" sacrifice? Ask yourself the question--then answer it by having your house wired now. We will do it for you at a very low cost. Let us tell you just how low it would be.

Yours Truly,

IRA W. FISHER, Pres.

THE FISHER ELECTRIC CO.

A HOUSE-WIRING APPEAL BY THE ELECTRICAL CONTRACTOR

One Month's Free Service for Each Old House Wired

Joseph W. McInnis, an electrical contractor of Wakefield, Mass., has advertised in the local papers offering to pay the first month's bill for electric service for any installation of house-wiring and fixtures made by him. This special offer applies only to already-built houses and does not include new dwellings.

Flood-Lighting the Flag—A Patriotic Installation at Leavenworth, Kan.

After nightfall the pedestrian who passes near the plant of the Leavenworth Light, Heat & Power Company has his attention attracted by a brightly illuminated American flag fluttering from the 150-ft. flagstaff, and lighted, as it floats in the breeze, by a 6-deg.-spread flood-lamp mounted on a nearby roof. The installation was made by C. S. Emmert, manager of the Leavenworth company, and has attracted much local interest. As a result, several similar flood-lighting installations of other objects are now planned, among them the illumination of a ground-glass star about 10 ft. in diameter on the steeple of the local Baptist church. By lighting the star from beneath both its sides will be illuminated from the single source of light.

Use of Indirect Illumination for Portrait Photography

Some photographers have voiced objections to arc lamps and concentrated-filament sources for portrait work even when the lamps are shielded by diffusing screens, on the grounds that such intensely bright spots in the subject's vision sometimes cause eye discomfort

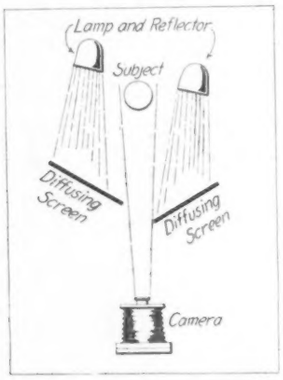
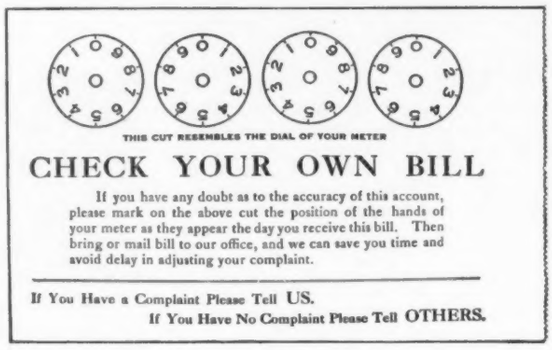


Diagram showing how an Ohio photographer lights his subject by means of diffusing screens, eliminating the direct glare of intense light sources.

and an unnatural expression. This objection has been remedied by an Ohio photographer by placing the lamps back of and on each side of the subject so the light can be cast on diffusing and reflecting screens placed in front of the subject, as shown in the accompanying drawing. With this arrangement the direct rays from the lamps are prevented from reaching the camera, and only soft, diffused light sources are exposed to the subject's vision.

Continuing Electric Service to Vacant Apartments and Dwellings to Attract New Tenants

At a recent electrical luncheon in Boston, Mass., Fred H. Smith, assistant general manager of the Worcester (Mass.) Electric Light Company, explained that when a rented apartment or leased dwelling in Worcester is vacated the company leaves the meter connected for thirty days in order to facilitate instant lighting and appliance service for incoming tenants. The electric-lighting fixtures are, moreover, provided with tags which inform persons entering the apartment that the lamps may be lighted in the usual way on turning the switch. This provision not only pleases the customer-to-be but also facilitates the inspection of apartments under favorable conditions after dark, without the customary old-fashioned match-and-gas demonstration.


THIS CUT RESEMBLES THE DIAL OF YOUR METER
CHECK YOUR OWN BILL
If you have any doubt as to the accuracy of this account, please mark on the above cut the position of the hands of your meter as they appear the day you receive this bill. Then bring or mail bill to our office, and we can save you time and avoid delay in adjusting your complaint.
If You Have a Complaint Please Tell US.
If You Have No Complaint Please Tell OTHERS.

ENLISTING THE CUSTOMER'S AID IN DETECTING ERRORS

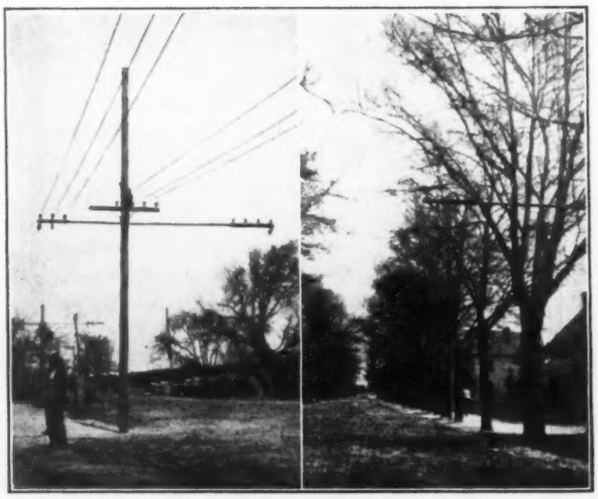
Letting the Customer Help in Checking Accuracy of Disputed Bills or Meters

On the back of each monthly statement sent out by the Minneapolis General Electric Company appears a group of four meter dials representing the dials of the customer's meter. As a means of checking the customer's bill in case he suspects the accuracy of the account or reading, the customer himself is asked to mark in the dials the position of the pointers on the day the bill is received, and to bring or send this marked copy to the company's office, where the record is of obvious value in enabling the meter reading to be checked promptly and without the delay and cost of dispatching an inspector to the premises to make a special reading.

A Mast-Arm Construction to Spare the Trees at Johnston, S. C.

The streets of Johnston, S. C., have double rows of beautiful water-oak and elm trees marking their curb lines. The citizens of Johnston are very proud of these trees, and in erecting its lines along the curbs the Carolina Public Service Company was required to use all possible care not to injure the branches.

To avoid cutting the trees and at the same time to get by with the lines, F. M. Boyd, manager of the company, devised the mast-arm construction illustrated in the accompanying two pictures. On the 25-ft. poles set along the curbs are mounted 12-ft. mast-arms made of 1½-in. by 1½-in. by ¼-in. angle-iron, and on the outer ends of these arms are carried the service wires, well away from the trees.



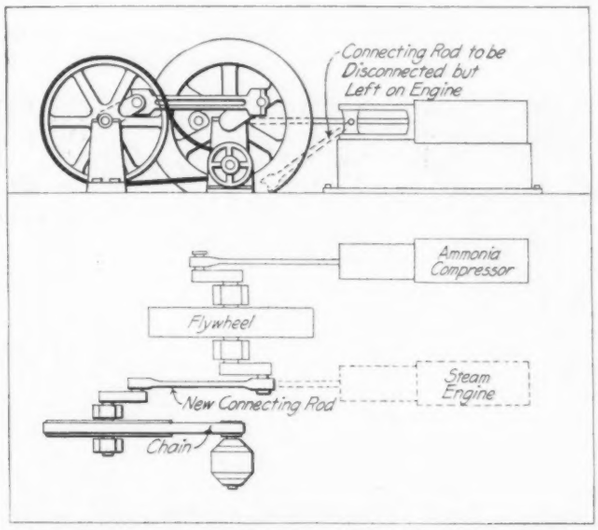
MAST-ARM CONSTRUCTION AT JOHNSTON, S. C., TO AVOID INTERFERENCE WITH THE TOWN'S BEAUTIFUL TREES

Success of Employees' Building Loan Association at Milwaukee

Twenty months' operation of the Employees' Mutual Saving, Building & Loan Association of the Milwaukee Electric Railway & Light Company has demonstrated the unqualified success of the organization. Beginning with an initial stock subscription of 4500 50-cent shares, representing a payment of $2,250 per month, it has grown in the short space of its existence to an outstanding stock value of $1,282,300. More than 30 per cent of the company's employees, from office boys and girls purchasing one to three 50-cent shares a month up to the officers of the company, have taken advantage of the opportunity thus afforded to lay aside systematically a small amount each month and receive the substantial interest return of 7 per cent per annum, compounded monthly. Some employees have taken advantage of their membership to build homes on a mortgage loan furnished by the association. These loans amount to $138,300 and are secured by first-mortgage loans on property valued conservatively at $289,128.98.

Securing Refrigeration Motor Load for the Summer Months

Under conditions existing in Chicago it is entirely feasible and practicable for the central-station company to serve isolated-plant owners on an off-peak schedule with energy for operating ammonia compressors, which during the colder months are driven by steam. The rate



CHAIN GEAR AND CONNECTING ROD FOR CONVERTING AMMONIA COMPRESSOR FROM STEAM TO ELECTRIC DRIVE

which the company can make for this off-peak service is attractive, and the service itself is of real value to the isolated-plant owner in that it permits him to use his exhaust steam in the winter and yet to discontinue entirely the operation of his steam equipment in the summer, when there is no application for exhaust steam.

For some time the principal drawback to the plan was a mechanical one. Motors could not well be belted to the flywheels of the compressors because the flywheels used were too narrow to carry a belt large enough to transmit the required power. New and wider flywheels could not be substituted economically because the existing flywheels revolved in narrow steel-lined concrete pits which could be enlarged only with a great deal of labor. Neither was it practicable to attach gear teeth to the flywheels' faces, since space was lacking and since the task of installing the teeth would necessitate discontinuing operation of the motor for several days.

A thoroughly practicable scheme for making the off-peak service available was worked out, however, by Nels Joleen of the Commonwealth Edison Company. As is shown on the sketch herewith, the new equipment needed consists of a slow-speed motor (say 514 r.p.m.), chain-connected reduction gears, a crank and a connecting rod. With the equipment installed it is only necessary when electric service is desired to disconnect the engine connecting rod from the crank, put the new connecting rod in place and start the motor. The whole change from steam to electric drive can be made by one man in less than thirty minutes when once the equipment is installed.

A Test to Gage Both the Salesman and His Territory

The difficulty of gaging the sales possibilities of one territory as compared with others and of convincing the individual salesman of the value of his own district has been experienced by all sales managers, and means of determining and demonstrating the relative values of sales quotas have often been sought. Last spring the United Gas Improvement Company of Philadelphia, Pa., tried an experiment along these lines, the results of which study have been made public by P. J. Naschold, representative of this company in the city district of Philadelphia. Through this experiment the relative values of the various sales districts were not only determined but were also demonstrated to the salesmen in a test which can be well applied by any utility in any good-sized city. The plan called for concentrating the fourteen salesmen assigned to an equal number of districts into each man's territory for two hours in the afternoon on two occasions during the course of the experiment. On Monday, Wednesday and Friday afternoons from 3 to 5 o'clock, the days selected as the campaign periods, the salesmen would meet at a point designated by the representative whose district was to be canvassed, and the streets to be canvassed and the nature of the appliances to be sold were also decided by him. As a result this plan gave each man an opportunity to show not only his personal ability to sell, but also his skill in mapping out a selling campaign with business-getting results. On the day previous to a territory canvass a boy delivered advertising matter to the residents of the district, thus arousing their interest in the appliances to be offered for sale and giving an opportunity for their being discussed before the representatives' calls. In the canvass the men worked in pairs, each pair taking one side of a designated street, and as a result of their combined efforts and arguments each pair of salesmen generally landed a sale wherever a prospective customer was in any way interested.

Credit for the earnings of the entire force during the period of working one man's territory were pooled, and the sum was given to the representative of the district to represent the value of that district under the experiment. At the same time, however, each man preserved a record of his own sales effected in all fourteen territories. The final results for the period from April 26 to July 30 are given in the accompanying tables. Assuming that the same energy was expended in each case, these tables show that some districts are better than others, the two extremes being district "A," with 112 points and with business to the value of $134.50, and district "I," with 631 points and with business to the value of $764.93. The tables also show that some men are better salesmen than others. It was, of course,

RESULTS SHOWING BUSINESS SECURED IN TWO CANVASSES IN EACH DISTRICT

RECORD OF EACH SALESMAN IN PERSONAL SALES IN HIS CANVASS THROUGH THE FOURTEEN DISTRICTS			BUSINESS GAINED IN EACH TERRITORY IN TWO CANVASSES BY THE FOURTEEN SALESMEN		
Salesman	Points	Amount	Territory	Points	Amount
A	296	$367.11	A	112	$134.50
B	470.5	571.66	B	537	706.74
C	272.5	309.41	C	299	351.85
D	278	310.21	D	443	474.63
E	220.5	223.19	E	426.5	380.00
F	384.5	466.38	F	330	318.39
G	291	362.21	G	304.5	349.05
H	307	283.16	H	464.5	547.23
I	447	548.31	I	631	764.93
J	735	873.16	J	198.5	216.53
K	268	324.91	K	340	392.60
L	382	378.28	L	338.5	439.00
M	479	565.93	M	386.5	419.23
N	561.5	597.83	N	581.5	687.07
Total.....	5,392.5	$6,181.75		5,392.5	$6,181.75

always believed that the districts were not of equal value and that the abilities of the salesmen were not the same, but the experiment enabled the company to obtain definite comparative figures on the various districts and thus furnished good material upon which to establish sales quotas.

The company feels that the total result of the work is not entirely covered by the data herewith given, for one must consider the stimulus given by the combined work of the men as well as the psychological influence in the districts covered, where the company's fitters were known to be connecting a large number of appliances. Moreover, many prospective customers were developed and afterward canvassed to good advantage.

Manufacturers' Exhibits in Central-Station Windows at Tonawanda, N. Y.

The Niagara Light, Heat & Power Company, a Doherty property, has been interesting the manufacturers of Tonawanda and North Tonawanda, N. Y., by offering the use of one of its windows without charge to the leading interests of that city, allotting one week to each manufacturer. This exhibit plan has made it possible for some manufacturers to make displays that would otherwise have been impossible, and the competition for the Niagara company's window has been keen indeed.

Advertising the Public Utility

Speaking before the February meeting of the Indiana Engineering Society, Merle Sidener, president of the Sidener-Van Riper Company, Indianapolis, Ind., said:

"The trouble with most public-utility companies is that they advertise after it is too late. They advertise on the defensive. After the franchise is almost expired and an enraged public has started some foolish ordinance agitation, or after the rates are about to be lowered by some public utility commission, then the public-utility company is ready to spend its money on the defensive.

"William G. McAdoo, president of the Hudson & Manhattan Railroad, New York, when he wanted to increase the rates started a big advertising campaign with the people and convinced them that it was necessary for him to raise his rates from 5 cents to 7 cents, and he got his rate increased because the people were convinced that it was necessary. He said: 'Our policy is based on the consistent belief that the public is reasonable—as reasonable as the average individual.' I believe he is right. If I had a water company and wanted to install meters, I would tell the people about it rather than the public service commission. To get the public on the side of the public utility it is only necessary to inform it of the public utility's needs and desires."

Night Delivery with Electric Coal Trucks

The Staples Coal Company of Boston, Mass., has found that night delivery is an important factor in handling its coal trade efficiently, and hence practically all of the coal which the company supplies to office buildings, warehouses, department stores, etc., in the business districts is now delivered after dark. Night delivery avoids the interference with traffic incident to unloading the coal trucks at the curb during business hours. The average delivery for an eighteen-hour day is 140 tons of coal, covering a total distance of about 56 miles at an approximate cost of $21. The Staples trucks are operated eighteen hours a day with two shifts of drivers, and the wagons average 34 miles on one battery charge. Use is made of two sets of cells, one set being kept on charge during the day for use on the night shift, while the second set is recharged at night.

An Idea That May Be Passed on to Your Photographer

The photograph reproduced herewith illustrates the fact that really beautiful night pictures of street lighting can be taken for central-station advertising purposes if the man behind the camera fully understands his work and if favorable conditions prevail. In this instance the photographer so placed the lens of his

BY SO PLACING HIS CAMERA THAT A TREE TRUNK INTERCEPTED THE DIRECT RAYS OF THE STREET LAMP, THE PHOTOGRAPHER SECURED A BEAUTIFUL PICTURE WITH ALL HALATION ELIMINATED

camera that a tree intercepted the direct rays from the 4-amp. arc lamp on the corner. Despite the fact that the picture has not been retouched no halation is visible.

Arc lamps in the residential district where the picture was taken are not widely spaced, and the camera man selected a point about midway between the lamps as the correct position for setting his machine. The presence of the snow, of course, proved a valuable aid in bringing out the "detail" in the view. The picture was taken at midnight following a recent snowstorm at Detroit, Mich., and will be used to illustrate the twentieth annual report of operation of the city's public lighting plant to be issued within a few days.

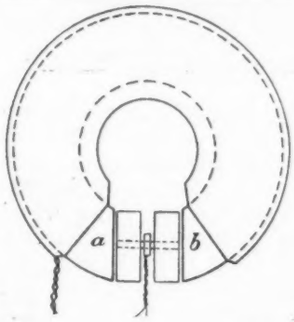
ADVANCE IN TECHNICAL THEORY AND PRACTICE

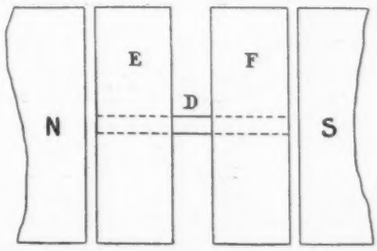
Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

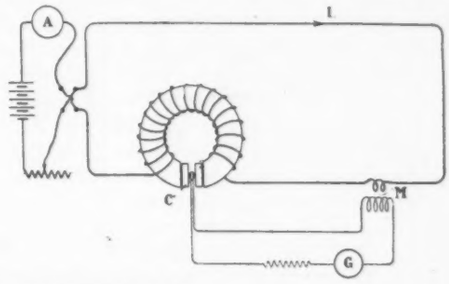
Magnetic Testing of Steel

Simple Apparatus Suitable for Tests of Bars and Bundles of Wires—Correction Factors—Typical Permeability Curves

FOR the magnetic testing of steel the recommendation was recently made in a publication of the German Reichsanstalt that the value of H be measured directly by means of search coils rather than having it calculated. It is interesting to note that the same conclusion is reached in a paper by Albert Campbell and D. W. Dye, contributed to the *Journal* of the (British) Institution of Electrical Engineers and published in abstract in the London *Electrician* of Feb. 7, 1916. The advantage is that the direct measurement of H eliminates the uncertainty regarding the length of the magnetic circuit. For iron surfaces the search coils are flat where possible and semicircular when round rods are used. A ballistic galvanometer having a sensitivity of 800 mm. at a meter and a resistance of 280 ohms is used.







FIGS. 1 TO 3—ARRANGEMENT OF APPARATUS FOR THE MAGNETIC TESTING OF STEEL

A very simple form of apparatus was devised by Campbell and Dye for the use of Ewing and Low's isthmus method. Fig. 1 shows the magnetic system, consisting of a well-laminated iron core of nearly square section (8 × 7 cm.) formed of ring stampings of about 22 cm. mean diameter, the polar air gap *ab* being about 8 cm. across. The winding consists of 1000 turns of copper wire of 2 mm. diameter (No. 14 S. W. G.), with a total resistance of about 2.2 ohms.

Fig. 2 shows the air-gap more in detail. N and S are the poles of the electromagnet. Thick soft-iron disks E and F form the pole pieces, and these do not touch the magnet poles, but are separated from them by small air-gaps (at 1 mm. or 2 mm. distance). The test piece D is fitted into central holes in the flat pole pieces, which are clamped in an independent frame so that they can be removed together from between the poles. The magnet is so designed that it permits quick reversal of the magnetic field.

When the pole pieces are not inserted, the H at the center of the wide air-gap is practically proportional to the magnetizing current (over the working range), 10 amp., giving a central H of 800. In the normal case, with the pole pieces leaving a central air-gap of 1.3 cm. when a test rod is in position, the H near the middle of the rod is very nearly proportional to the current. For example, with a certain iron rod, $H = 390\ (I - 0.2)$ for a range of I from 1 amp. upward. Thus 10 amp. will give $H = 3820$. The specimen tested is in the form either of a rod 7 cm. long and 0.5 cm. in diameter or an equivalent bundle of strips or wire.

At the middle point of the test rod is placed a small ebonite bobbin with an inner winding of forty turns for measuring B and three outer coils of 400 turns each used differentially for determining H. With rods of small section, and more particularly with small bundles of strip, the difference between the cross-section of the iron and the area of the search coil for B is considerable, and this necessitates a large correction on the observed value of B. If s = area of iron, s_1 = search-coil area not occupied by iron, then true B = observed $B - Hs_1/s$. The correction increases in proportion to H. To avoid the trouble of applying this varying correction to each observation, the compensating method shown in Fig. 3 is used. A small mutual inductometer M is arranged with its primary coil in series with the magnetizing circuit of the magnet and its secondary coil connected in opposition to C, the search coil for B, in the ballistic galvanometer circuit. The interpolar value of H is approximately proportional to the magnetizing current I_1; thus $H = hI_1$, where h is approximately known. Now, let the small inductometer be set so that

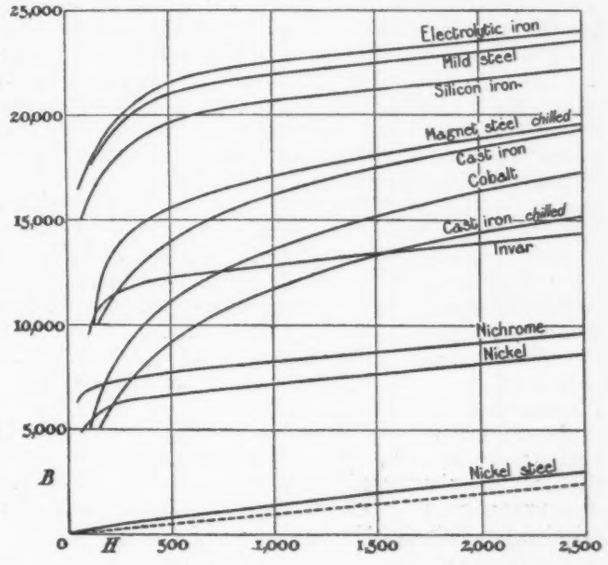


FIG. 4—CURVES SHOWING RATIO OF B TO H

$M = 10^{-8}hs_1$. If φ be the flux in the secondary coil of M, due to current I_1, then $\Phi = 10^{-8}MI_1 = hs_1I_1 = Hs_1$, and hence the inductometer automatically subtracts the term Hs_1/s and gives the true value of B for all values of H.

Fig. 4 gives an interesting set of B-H curves obtained by this apparatus, the samples being in the form of thin rods or bundles of strips. The lowest curve is the straight line for air (permeability = 1). All the other curves ultimately tend to become parallel to the air line as the magnetization is increased, close parallelism indicating that the material has reached the condition of magnetic saturation.

Generators, Motors and Transformers

Predetermination of the Performance of Dynamo-Electric Machinery.—MILES WALKER.—A paper in abstract read before the (British) Institution of Electrical Engineers. It is possible to have one general method of calculation for all dynamo-electric machines. The methods available may be divided into two classes —first, those which take as the basis of the design the total flux per pole, and, second, those which take as the basis the maximum flux density in the air-gap. The first method is not so generally practicable as the second. The author shows how they may be combined. The procedure is described for the calculation of the performance of a three-phase turbo-generator from the dimensions of the machine and for the calculation of the performance of an induction motor from the dimensions of the machine. A first appendix deals with plotting the field form of a cylindrical field magnet with highly saturated taper teeth. The paper is to be concluded.—London *Electrician*, Jan. 14, 1916.

Lamps and Lighting

Production of Light by the Recombination of Ions.—C. D. CHILD.—In a recent article by Strutt a description is given of experiments on the luminous vapor distilled from the mercury arc. The conclusion is there reached that the light given off by the vapor comes from the positive ions, while the conclusion reached in a recent article by the present author was the opposite of this. His reasoning led to the belief that the light does not come from either the positive or the negative ions alone, but from the two at the time of recombining. The author explains in detail why he prefers to hold the conclusions of his previous article that the light produced by the vapor rising from the mercury arc is due to the recombination of ions. If it is possible to hold this view, it is more reasonable to do so than to adopt the seemingly impossible assumption that the positive ions remain luminous for 0.001 second. In the case of mercury vapors the assumption that light is produced by recombination is, therefore, to be preferred.—*Philos. Mag.*, February, 1916.

Drawn-Tungsten Wire.—An English translation in abstract of a recent review in the *Elektrotechnische Zeitschrift* (abstracted before in the Digest) of different processes of making ductile tungsten.—London *Electrician*, Feb. 4, 1916.

Installations, Systems and Appliances

Heating and Ventilation Laboratory.—An illustrated description of a special laboratory for research on heating and ventilation which has been established by Prof. A. H. Barker at the University College in London. Apparatus are provided for measuring the true temperature of the air and for measuring convection and radiation of heat. A systematic series of tests of electrical radiators was carried out. In order to capture all the hot air rising from the heating apparatus, a kind of hood or cowl was devised, in the shape of a well-lagged pyramid, to the apex of which a flue was attached. To insure that no eddies should escape capture it was found necessary to draw air gently through the flue with an electric fan. To measure the rate of flow of the air a grid of resistance wires was fixed in the flue and supplied with sufficient electrical energy at a known rate to keep its temperature slightly above that of the air current. The arrangement is indicated diagram-

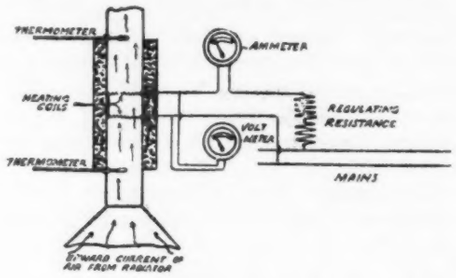


DIAGRAM OF APPARATUS FOR STUDY OF ELECTRIC HEATING

matically. By measuring the temperature of the air below and above the grid, knowing the specific heat of the air and the rate of dissipation of energy by the grid, the rate of flow of the air could be accurately determined, and the amount of heat energy which it received from the radiator could then be ascertained, the true temperature of the surrounding air being known. To measure the heat radiated in any given direction, an iron bar bent to the arc of a quadrant was fixed with the radiator at its center and a movable thermopile was attached to the arc, thus giving readings at all angles in a vertical plane through the radiator. By shifting the arc round the radiator the radiation at a series of angles in other vertical planes could similarly be measured, and the result was a map of the space surrounding the radiator, showing the intensity of the radiant heat at points on the surface of a sphere of 5-ft. radius —a distance taken as standard in these investigations. To avoid the necessity of moving the thermopile about the radiator, a cradle was made for the latter, by means of which it was made possible to explore the field of radiation by rocking the radiator into various positions while keeping the thermopile fixed. The thermopile was calibrated to give watts per square foot at 5-ft. radius. —London *Elec. Review*, Feb. 4, 1916.

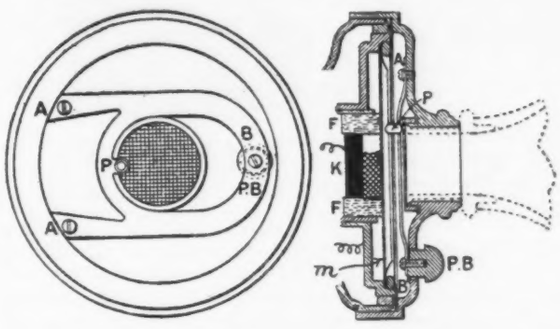
Units, Measurements and Instruments

A Sparkless Break of an Inductive Circuit.—T. F. WALL.—The author investigated mathematically the current and voltage curves when an inductive circuit is closed. If the resistance is negligible and the circuit is closed at the moment when the wave of applied pressure passes through its zero value, there results a unidirectional current pulsating between zero and a maximum value, and the circuit can be broken sparklessly whenever the current is zero because the voltage is then also zero. The author shows that the effect of resistance may be compensated by superimposing a continuous-current pressure, and thus sparkless breaking may be secured also in this case. Practical results confirm the theory.—London *Electrician*, Feb. 4, 1916.

Telegraphy, Telephony and Signals

Microphones and Microphonic Contacts.—P. O. PEDERSEN.—The author first describes some simple experiments with microphones showing the great influence of even very minute displacements of the diaphragm on the sensitiveness of a microphone. Increase of sensitiveness is always accompanied by an increase of re-

sistance of the microphone. The resistance of the transmitter may equally be increased by a transitory inward displacement of the diaphragm and by a permanent outward displacement. An arrangement by which the diaphragm may be given such a transitory displacement without any danger of hurting the diaphragm or other parts of the microphone is shown herewith. On the flat spring *ABA* is fastened the press button *PB* and an insulating pin *P*. When the button is pressed, *P* exercises a slight pressure on the diaphragm *m*, and the



ARRANGEMENT OF DIAPHRAGM IN MICROPHONE

pressure ceases as soon as the button is released. The result is a great increase of resistance and a corresponding increase of sensitiveness. The accompanying table shows some of the results obtained with such a transmitter. R_1 is the resistance just after shaking the transmitter, R_2 the resistance when the button has been pressed. It appears that the ratio R_2/R_1 has the greatest value for small currents. The normal current is 20 milliamp., and for 30 milliamp. the ratio is still about 2.5. When the transmitter, before pressing the button, is "packed," this ratio is, of course, much greater. The acquired increase of resistance is naturally lost when the transmitter is violently shaken, but it possesses a remarkable stability. The transmitter may be moved about and turned in all directions up to angles of, say, 30 deg. to 40 deg., and still retain about half of the

RATIO OF RESISTANCE TO MICROPHONE CURRENT

Microphone Current, Milliamps.	Resistance		R_2/R_1
	R_1, Ohms	R_2, Ohms	
2.5	128	552	4.31
	160	568	3.55
	128	520	4.07
	116	520	4.49
	128	592	4.64
	120	608	5.06
	128	604	4.72
	128	616	4.83
	144	528	3.67
10.0	125	370	2.96
15.0	113	295	2.61
20.0	95	245	2.59
30.0	74	182	2.46

original increase. The author then takes up the discussion of the relation between the resistance and the sensitiveness of a microphone. The article is to be concluded.—Translated in abstract from *Elektroteknikeren* in London *Electrician*, Jan. 28, 1916.

Miscellaneous

Protection Against Lightning.—O. S. PETERS.—A long account, comprising 127 pages, of a study of the protection of life and property against lightning. A few of the chief results are as follows: Such evidence as is available on the effectiveness of lightning rods indicates that, taking rods as they come in the general run of installations, they reduce the fire hazard from lightning by 80 to 90 per cent in the case of houses and by as much as 99 per cent in the case of barns. Failures of lightning rods to give adequate protection are in many cases due to neglect to make extended metallic masses in proximity to the rods a part of the lightning-rod system. When these metallic masses are included in the system in the proper manner the danger of a flash leaving the rod and penetrating the building is much reduced. There are two systems of protection in successful use, i.e., the contour system and the point system. Both systems present certain advantages, but it seems that the advantages obtained in the use of points outweigh the advantages of the other system. The maximum current of a lightning flash may be more than 20,000 amp. A flash of lightning consists in most cases of a number of consecutive discharges of varying character which follow each other along the same path with very short-time intervals between them. The rate of variation of current at any point of the path of each of the consecutive discharges of a flash of lightning is probably in most cases such as to make its effects similar to those of currents of frequencies of the order of several hundred thousand cycles per second, with the wave train so rapidly damped as to make it practically a unidirectional discharge. The magnetic effects observed in many instances point to either a unidirectional discharge or rapid damping. In fact, there seems to be no good reason for believing that a lightning discharge is oscillatory, although secondary effects from lightning discharges in neighboring conductors may be of an oscillatory character. The instantaneous potentials which may be set up between rod and earth by a flash of lightning because of the resistance of the earth connection may easily reach 500,000 volts or more with earth connections of the resistance of those ordinarily met with in practice. The resistivity of the metal used is not of paramount importance. The metals commercially available as materials for lightning rods, and which meet all of the other requirements in greater or less degree, are copper, aluminum and iron. The most important property which must be possessed by the metal of which a lightning rod is made is resistance to atmospheric and soil corrosion. To impart this property to iron it must be galvanized. Corrosion of copper rods by smoke and gases can be effectively prevented in most cases by covering the rod with lead. The rods sold at the present time which seem preferable are star-section iron rod and tightly twisted copper cable. The most economical and satisfactory earth connections are made with cast-iron or copper rods extending into the earth to a depth of from 6 ft. to 10 ft., or to a point well below the foundation walls of the building to be protected. The resistance of the earth connection should be made as low as practicable, it being impossible in most cases to get too low a resistance. A resistance which rises much above 15 ohms or 20 ohms at any time should be considered as excessively large. Aerial terminals with points should be installed at all chimneys, gables, points or other projections toward which a stroke of lightning might be directed. This is because a point cannot be relied upon to protect objects other than the one upon which it is placed. Down conductors should be run in such a way that a stroke on any aerial terminal of a structure will have two or more widely separated paths from the foot of the aerial terminal to earth. One path from an aerial terminal to earth has been found unsafe, and to have more than two is preferable.—*Technologic Papers, Bureau of Standards, No.* 56, Dec. 15, 1915.

F. R. SLATER

F. R. Slater, who for the last three years has been general superintendent of the Texas Power & Light Company, with headquarters at Dallas, has been appointed acting general manager of the company, succeeding George S. Haley, who resigned recently. Mr. Slater is a graduate of Cornell, class of 1894, and after work on the design of the new power station for Columbia University entered the organization of the Otis Elevator Company as a designing engineer. Upon the outbreak of the Spanish War he served as adjutant in the first United States Volunteer Engineers, and, returning in 1899, he joined the forces of the Manhattan Railway Company, New York City, which was then converting its lines from steam to electric operation. Later he became a member of the engineering staff building the New York subway, being assistant engineer in charge of direct-current distribution, and later principal assistant engineer, of the Interborough Rapid Transit Company. In 1907 Mr. Slater formed with H. N. Latey the consulting engineering firm of Latey & Slater, from which he withdrew in 1912 to go to Dallas. At the time of the St. Louis Exposition in 1904 Mr. Slater served as a member of the advisory council of the Electric Railway Test Commission.

W. E. Murchie has been appointed manager for the Southern Indiana Power Company at Bedford, Ind.

W. H. Vorce, formerly manager of the Vermont Power & Manufacturing Company of St. Albans, Vt., has been appointed vice-president and general manager of the Choctaw Railway & Light Company of McAlester, Okla.

Glen D. Bagley, who for the past two years has been with the General Electric Company in Schenectady, N. Y., has recently been appointed assistant professor in the University of Pittsburgh at Pittsburgh, Pa. Mr. Bagley was graduated from the University of Illinois in 1912.

Andrew F. Pope of Hull, Mass., has been appointed manager of the Hull municipal electric light plant, succeeding Harry B. Willard, who had charge of the plant for about twenty-two years. Mr. Pope has been connected with the plant since 1903 and for the past two years has been superintendent.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

W. R. Bowers of New York, N. Y., has been appointed manager of the Union City (Pa.) Electric Light & Power Company, succeeding R. W. Baker, who has been transferred to Palestine, Tex.

Carroll D. Cabaniss has been appointed sales manager for the Southern Atlanta (Ga.) district of the Western Electric Company. Mr. Cabaniss has been with the Western Electric Company since he left the University of Georgia in 1908.

R. W. Baker, formerly superintendent of the Union City (Pa.) Electric Light & Power Company, and who is also vice-president of the Interstate Electric Light & Power Company of New York City, has been transferred to Palestine, Tex., where he will assume the superintendency of the Palestine Ice & Electric Light Company.

Channing R. Dooley, who has been appointed manager of the new educational department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has for some years been in charge of the company's

C. R. DOOLEY

educational activities and also active in the work of the Society for the Promotion of Engineering Education, the educational committee of the American Institute of Electrical Engineers, and the Association of Corporation Schools. Mr. Dooley is a graduate of Purdue University, Lafayette, Ind., and entered the Westinghouse plant in 1902. In 1905 he became connected with the power-engineering department, devoting himself particularly to rotary converters and alternating-current generator work. In 1906 he was elected president of the Casino Technical Night School at East Pittsburgh, which has since grown until it has more than 700 students, practically double the number when Mr. Dooley took charge.

R. S. WALLACE

R. S. Wallace, the new president of the Illinois State Electric Association, is vice-president and general manager of the Central Illinois Light Company at Peoria, Ill. Mr. Wallace is a native of Illinois and a graduate of the engineering school of the University of Illinois. Entering the public utility field about fifteen years ago, after ten years spent in different branches of engineering work, he has served the Central Illinois Light Company and its predecessor companies as chief engineer, as department superintendent, and in other capacities. During the five years he has been in his present position he has been instrumental in extending the company's field of operation, which originally was confined to the city of Peoria, to cover a large part of the five contiguous counties. The company now operates gas, electric and heating utilities in Peoria and in Pekin and supplies electric service to twenty-five other cities and villages.

T. A. Lees has been appointed manager of the Manchester (Mass.) Electric Company, succeeding A. Lovering, who recently resigned.

John A. Porter, who has been connected with the Light & Development Company of St. Louis, Mo., for the last eight years in the capacities of plant manager, director and assistant to the president, has been elected vice-president of the company. Mr. Porter was more than twenty years the manager of the public-utility companies at Paris, Tex., and for the last three years has been in the company's general offices in St. Louis, although much of his time has been spent outside among the properties in eight states where the company owns about thirty utility plants.

Obituary

John M. Eshleman, author of the California utility commission law and first president of the California commission, died at Indio, Cal., Feb. 28, while en route to Los Angeles from Washington. Mr. Eshleman resigned from the commission in 1914 to become Lieutenant-Governor of California, the position which he held at the time of his death. Mr. Eshleman was only thirty-nine years of age.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Concentric-Wiring Devices for Installation in Existing Buildings

In the ELECTRICAL WORLD of last week mention was made of the fact that the General Electric Company, Schenectady, N. Y., has recently placed on the market a line of concentric-wiring devices, including cut-outs, junction boxes, snap switches, sub-bases, key and keyless receptacles, pull receptacles, polarity caps, fused and fuseless rosettes, sockets, clamps and tools. On this and the following page we now reproduce illustrations of a number of these devices.

These fittings have been developed for use on single circuits or 660-watt branch circuits in the wiring of existing buildings. Data compiled by the committee on wiring of the N. E. L. A. indicate, the manufacturer points out, that there are in almost every city numbers of small houses which the owners will not have wired because all of the standard forms of wiring are more or less expensive and, with the present methods of wiring, it is necessary to disturb the wall decorations, more or less, in order to obtain neat installations. The concentric wire is installed directly on the surface of the wall and can be covered with paint or paper.

The fittings are arranged so that joints can be quickly and well made by expert wiremen and are designed so that the grounded sheath is continuous throughout the system. Because of the possibility of injuring the rubber insulation on the wire, the use of solder for joining conductors is considered inadvisable. It is, of course, necessary that the outer sheath be carefully grounded at the service switch so that the whole system will be thoroughly grounded.

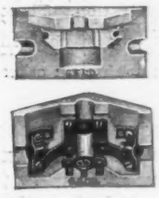
In the accompanying illustrations are shown various types of surface devices which will be most generally used in the smaller and more inexpensive houses. Flush switches and flush plug receptacles, however, are also being developed for use with concentric wire. The manufacturer also directs attention to the fact that concentric-wiring systems can be installed only with special permits from local insurance or municipal inspection bureaus.

The list prices range from 1 cent for supporting clamps to $1.10 for a combined three-wire, two-circuit switch and plug cut-out. All these parts have a standard catalog number and are sold in standard packages of 100 each, with the exception of the clamps, which are sold in lots of 500 each.

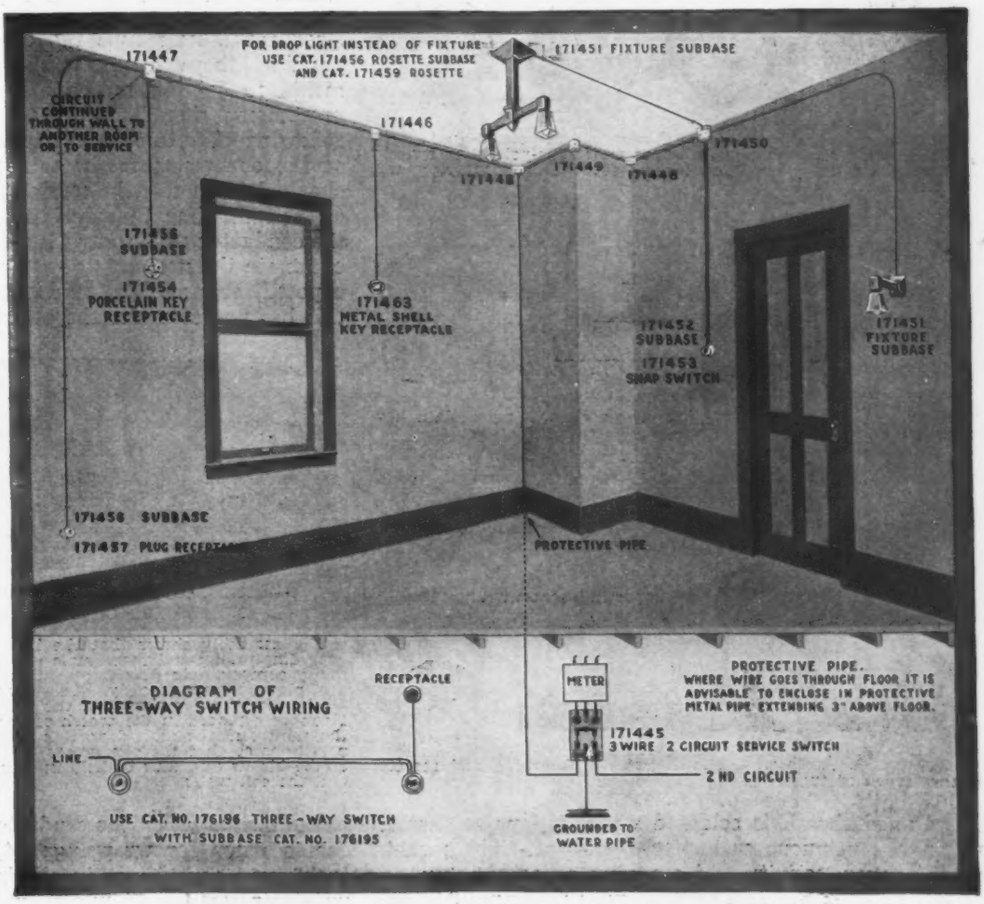
The wire shown herewith has for its inner conductor

Three-way branch junction box

Four-way branch junction box

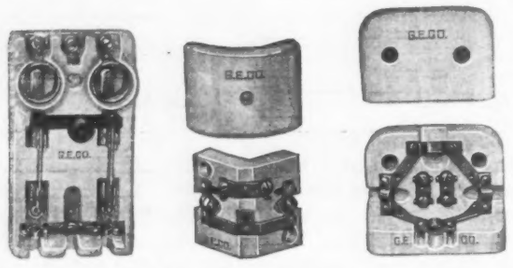


Inside-corner junction box


171447
FOR DROP LIGHT INSTEAD OF FIXTURE USE CAT. 171456 ROSETTE SUBBASE AND CAT. 171459 ROSETTE
171451 FIXTURE SUBBASE
CIRCUIT CONTINUED THROUGH WALL TO ANOTHER ROOM OR TO SERVICE
171446
171450
171448
171449
171448
171456 SUBBASE
171454 PORCELAIN KEY RECEPTACLE
171463 METAL SHELL KEY RECEPTACLE
171452 SUBBASE
171453 SNAP SWITCH
171451 FIXTURE SUBBASE
171456 SUBBASE
171457 PLUG RECEPTACLE
PROTECTIVE PIPE
DIAGRAM OF THREE-WAY SWITCH WIRING
RECEPTACLE
METER
PROTECTIVE PIPE. WHERE WIRE GOES THROUGH FLOOR IT IS ADVISABLE TO ENCLOSE IN PROTECTIVE METAL PIPE EXTENDING 3" ABOVE FLOOR.
171445 3 WIRE 2 CIRCUIT SERVICE SWITCH
LINE
2 ND CIRCUIT
USE CAT. NO. 176196 THREE-WAY SWITCH WITH SUBBASE CAT. NO. 176195
GROUNDED TO WATER PIPE

TYPICAL INSTALLATION OF SURFACE CONCENTRIC-WIRING DEVICES

a No. 14 B. & S. single-braided, rubber-insulated solid wire, National Electric Code standard. The wire is primarily an inner conductor surrounded by an insulating wall and jacketed over all with a closed tinned-sheet-copper sheath, folded longitudinally around the wire, with a full lap giving uniform and double thickness.



Combined switch and plug cut-out, three-wire, two-circuit; outside corner junction box, and junction box for snap-switch circuits.

Fluted-catch key receptacle with porcelain base; and key, keyless and pull sockets with ⅛-in. caps.

Supporting base for lighting fixtures; single-pole, 5-amp., 125-volt indicating snap switch; sub-base for single-pole snap switch, and sub-base for long receptacles, separable receptacles and rosettes.

Pliers for cutting and stripping concentric wire; porcelain key receptacle, and separable receptacle with cap.

Bending tool and clamp for supporting concentric wires.

Piece of concentric wire, showing metal sheathing and rosette (either fused or fuseless).

The tinned sheath is soldered where it laps so that it forms a continuous water-tight and gas-tight jacket, having a conductivity and carrying capacity in excess of No. 12 B. & S. The finished wire measures 0.22 in. over all.

The Insulation of Joints in High-Tension Cables

Insulating Barriers Easily Inserted Between Conductors, and Provisions for Maintaining Their Proper Relative Positions

The extension of polyphase underground systems and the increase of transmission voltages during recent years called for by the concentration of electrical generation and bulk distribution of electrical energy have attached increased importance to the reliability of cable systems. While improvements in the manufacture of cable have kept pace with the increasing demands of operation, experience has shown that the joint between sections of the cable is the weakest point.

The extremely unfavorable conditions, such as limited space, damp atmosphere, etc., under which most high-tension cable joints have to be made has emphasized for a long time the desirability of meeting, if possible, these handicapping conditions by improvements in joining methods and materials. Such improvements should, as far as possible, accomplish the following objects: (1) minimize the time of exposure of the open ends of the cable; (2) facilitate the mechanical joining of the conductors by soldering all three at the same time, thus avoiding the necessity of bending the conductor ends away from their usual position; (3) eliminate the necessity of replacing insulation over the exposed section of the conductors by hand-wrapping, as this has proved under the best conditions to be unequal to the insulation on the conductors and requires a great deal of time for wrapping; (4) provide insulation in such form as entirely to eliminate the variations and uncertainties due to workmanship, and so design the insulation of the joint that it is reduced to a simple

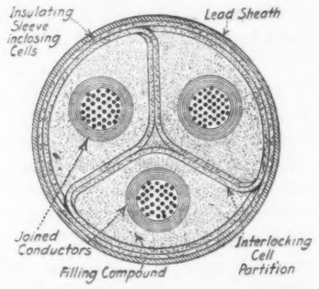


FIG. 1—CROSS-SECTION OF COMPLETED JOINT

Just inside the lead sheath protecting the joint and confining the compound is an insulating sleeve which incloses three interlocking cell partitions identical in form. The space around the conductors is filled with compound. This view indicates the high degree of insulation between conductors, the long leakage path between cells, and particularly the close centering of the conductors in their respective cells afforded by the self-supporting form of insulation and by the spacing blocks at the ends.

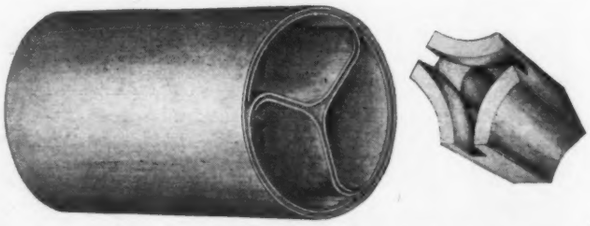


FIG. 2—ASSEMBLED CELL PARTITIONS, INCLOSING SLEEVE, AND ONE OF THE CONDUCTOR-SPACING BLOCKS

The assembly shows that the leakage paths between cells are exceedingly long and that ample space is provided in the cells for filling compound to flow freely around the conductors when they are placed symmetrically. The correct spacing is insured by blocks like the one shown at the right of the illustration. These blocks are placed in the crotch of the conductors on each side of the joint and the slotted portion fitted over the ends of the cell partitions so that the conductors will lie on the concave surfaces of the blocks and thus be held in definite relation with each other and the cell walls.

mechanical assembly of parts that when assembled must necessarily be in the proper position and uninjured.

To meet these conditions and produce a joint insulation which will equal that of the cable, the materials and joining method described below have been developed. The insulation, known as "Conducell," comprises a seamless outer sleeve of a material (micanite) of high dielectric strength and three identical inner sections of such shape that they may be assembled singly after the three conductors are metallically joined. When the three parts are assembled there is an unusually long leakage path between conductors. Furthermore, the spacing around each individual conductor is elliptical, so that ample room is provided for the filling compound to flow freely into all spaces and leave no voids. The three inner sections when assembled interlock and present a uniform circular contour on their outer surface over which the seamless sleeve may be drawn. These insulating barriers are held in positive relation to the conductors by means of porcelain blocks like the one shown herewith. The blocks insure equal separation and amount of insulation between each conductor, as well as between them and the lead sheath. The relation of parts and the method of assembling them are indicated in the accompanying illustrations. It will be noted that the length of exposed individual conductor is relatively short, resulting in materially reduced overall dimensions of the joint.

One important feature not clearly brought out by the illustrations is the facility with which this insulation may be assembled around the conductors. The three inner sections are identical in shape and entirely separate from each other. Owing to their shape, they may be placed between their respective conductors and brought into final position very readily. The operation requires only a few minutes and no assistance from the splicer's helper. Besides reducing the cost of labor, this method of assembly minimizes the length of exposure of the cut ends of the insulation to the atmosphere.

The "Conducell" insulation is furnished in three standard sizes designed for various voltages used in high-tension transmission as follows:

For 2000-volt to 9000-volt circuits—8 in. long, 4 in. outside diameter, ⅛ in. thick.

For 10,000-volt to 14,000-volt circuits—8 in. long, 4 in. outside diameter, 3/16 in. thick.

For 15,000-volt to 25,000-volt circuits—8 in. long, 5 in. outside diameter, 3/16 in. thick.

Each set is provided with spacing blocks, as already illustrated, packed in cartons for protection in handling. Continued tests on various sizes of commercial joints of this type have shown that they will withstand 200 per cent normal potential indefinitely and that the ultimate break-down is higher than that of the cable itself, resulting in a joint that has a permanent value higher than that of the cable.

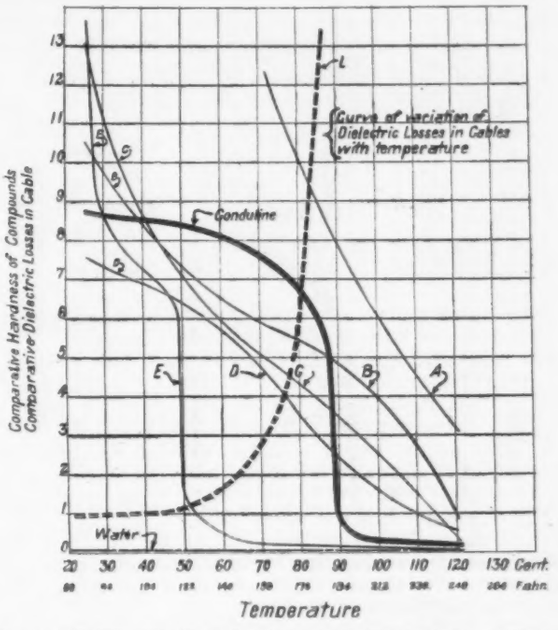
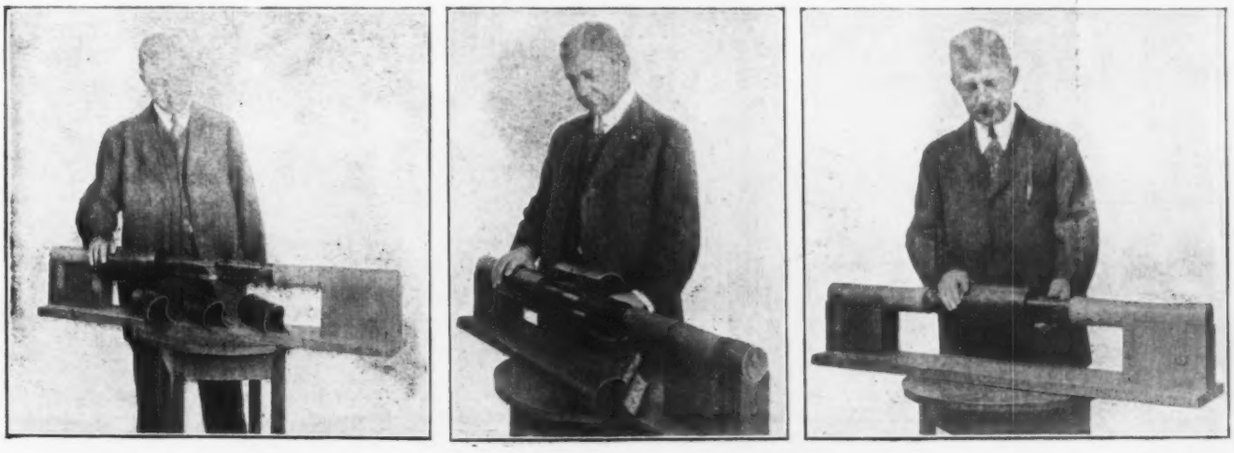


FIG. 6—EFFECT OF TEMPERATURE ON DIELECTRIC LOSSES IN CABLES AND ON HARDNESSES OF VARIOUS JOINT-FILLING COMPOUNDS

In developing a compound for use with this type of joint it was concluded that the following characteristics are desirable: At normal temperature the compound should not become so hard as to crack in case of shock or displacement. Furthermore, it should be soft enough to conform slowly to the shape of its container in case of displacement or movement of the cable, and should drive to the surface any bubbles that may have been caused in the process of filling, thus largely eliminating the possibility of deterioration from ozone. While slight plasticity is desired at normal temperatures, the viscosity should not change materially between the nor-



FIGS. 3, 4 AND 5—STEPS IN THE PROCESS OF ASSEMBLING JOINT

In Fig. 3 are shown three conductors of a joint after soldering held in relatively fixed positions at the proper spacing by blocks placed in the crotch of the conductors on each side of the joint. The outer insulating sleeve is at one side to permit working on the joint. Below it are the three insulating cell partitions. Fig. 4 shows the cell partitions being inserted between conductors. When these have been assembled they interlock, forming elliptical-shaped cells around the conductors and presenting a smooth cylindrical surface. Over this is drawn the outer sleeve, making the completed assembly appear as in Fig 5. The latter affords a comparison of the relative proportions of the insulating sleeve and exposed cable.

mal and maximum temperatures at which a cable is ever operated. Immediately above the maximum cable temperature and within the minimum additional temperature change, the viscosity curve should be as close to that of a fluid as possible. The last-mentioned characteristic insures a fluid state through the widest possible range of temperature which may be encountered during pouring of the compound and while it is imparting heat to the remainder of the joint.

The accompanying curves afford comparison of the characteristics of a compound which is recommended and known as "Condulene" with other compounds now on the market. In addition to possessing the advantages shown by the curves, this new compound, the manufacturers declare, has the usual characteristics of most of the materials used for similar purposes, is moderate in price, has high and stable dielectric value, and is easily handled. "Conducell" and "Condulene" are manufactured by the Mica Insulator Company, 68 Church Street, New York City.

Panelboard

The busbars on the panelboards being manufactured by the George Cutter Company of South Bend, Ind., are superimposed upon each other instead of being placed side by side, as is the usual practice. The neutral busbar in this arrangement is made the top member, so that it, with its branch bars, forms a protective covering over the live buses of the panel. In this way the danger of unskilled workmen coming in contact with live parts is practically eliminated and the danger of accidental short-circuits caused by metal pieces striking across the busbars is reduced to a minimum.

This arrangement of the buses possesses a further advantage in that it permits all panels, regardless of whether they are two-wire or three-wire panels and regardless of their number of circuits or current rating, to be made of uniform width. This uniformity, of course, is an aid to building designers, since it eliminates the necessity of looking up panel widths whenever one is to be used. Moreover, the panels are from 2 in. to 4 in. narrower than usual. The boxes required for these panels are no deeper than those ordinarily used, because box depth is controlled in both cases by the height of the space taken by the fuses.

The panels can be equipped with knife switches, push-button switches or snap switches. When either of the latter two types are employed they are covered with black-composition insulating caps. The porcelain sockets are also coated black so that a completed panel presents a harmonious black and copper finish.

The photograph herewith shows one of the fifteen "dead-front" panelboards used to serve 410 circuits in the New Morrison Hotel at Chicago. This particular board is only 58 in. high and 7 in. wide and carries twenty circuits besides a 100-amp. main switch.

TWENTY-CIRCUIT PANELBOARD

A 30-Volt Lighting Set

The "Midget" seven-lamp (16-cp.) 30-volt lighting outfit shown herewith has recently been brought out by the Main Electric Manufacturing Company, 500 Aiken Avenue, Pittsburgh, Pa. The set is mounted on a skid to make it a portable unit and may be operated by a gasoline engine of the proper rating. The outfit is self-contained and, according to the manufacturer, complete in every detail. The small slate switchboard can be folded for shipping purposes. All wiring between dynamo, battery and switchboard is done in the factory, so that it is ready for operation immediately after delivery. The switchboard contains a double-reading ammeter, double-pole, double-throw and single-pole, single-throw switches, automatic circuit-breaker, rheostat, cartridge fuses, etc. It is also provided with a resistance coil for cutting down the voltage of the dynamo when the lights are drawn at the time of charging. The battery is of the fifteen-cell inclosed type (hard-rubber jars) and is mounted in one tray. It has a capacity of 35 amp.-hr. The generator operates at 40 volts and is rated at 200 watts.

SEVEN-LAMP GENERATING SET

Ornamental Wall Brackets

To meet the demand for plain, heavy, substantial brackets which will be in keeping with the architecture of commercial and public buildings, the Herwig Art Shade & Lamp Company, 2140 North Halsted Street, Chicago, Ill., has brought out the two brackets shown herewith. Brackets of the style shown have been installed on substations, telephone buildings, police stations, firehouses, municipal buildings and commercial houses. The wall bracket shown in Fig. 2 measures 10.75 in. to the top of the holder and 10.5 in. from the wall to the center of the bracket. The back plate is 7.5 in. by 9.75 in. and the holder

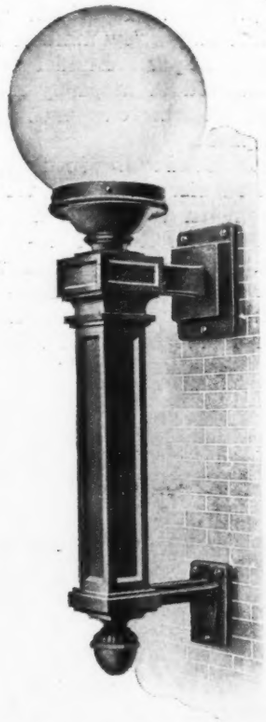


FIG. 1—BRACKET WITH TWO SUPPORTS

is 6 in. in diameter. The bracket shown in Fig. 1 measures 28 in. to the top of the holder and 7.5 in from the wall to the center of the bracket. It is provided with a 3-in. body and a 6-in.

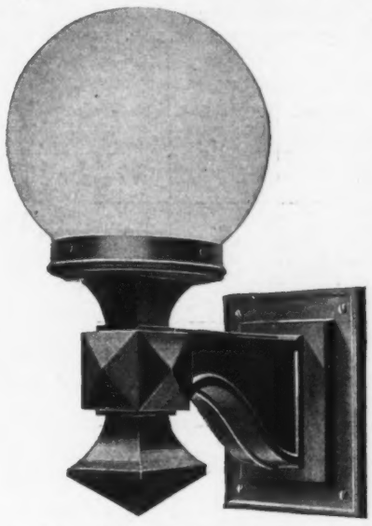


FIG. 2—WALL BRACKET WITH SINGLE SUPPORT

holder. The upper back plate is 5.5 in. by 7 in. Both brackets are of cast metal and are finished in a weatherproofing paint of dull black.

Service Entrance Caps

A new line of type FM "caplets," as they are called, has recently been placed on the market by James C. Phelps, Springfield, Mass., for whom L. E. Frorup & Company, 232 Greenwich Street, New York, are sole selling agents. The fittings are designed to save time for the contractor and to give a first-class job when installed. They are weatherproof and will not rust or corrode, it is declared, under any condition. The body piece is screwed on the conduit, the conduit attached to the building, and the wires drawn in and bent down. The cap piece is then set over the wires and the screws tightened. The screws are placed in holes in the upper side of the cap piece, so that they will not drop out when putting the cap on. The same

CAP FOR SERVICE ENTRANCE

fitting may be used for either two or three wires. To make it a three-wire fitting it is only necessary to break off the lip that covers the middle hole in the cap piece.

Combined Concrete Signpost and Lighting Pole

In the accompanying illustration is shown a concrete standard which may be utilized both as a signpost and a lighting pole and which should prove especially attractive in rural or suburban districts. The pole is reinforced by six ⅝-in. deformed steel rods running the full length of the post. It carries an 0.5-in. conduit throughout its length and is 14 ft. high, 4 ft. of the pole usually being below ground. The pole is 9 in. in diameter close to the top and is beveled to a diameter of 4 in. at the extreme top. The pole weighs complete 600 lb. The guide arms are inserted in such a way as to make them non-removable except by breaking them to pieces. The base is made in two sections, so that the guide arms of the upper section may be readily regulated to point at any angle. The lamp is inclosed in a globe at the top of the pole as shown and throws light on either side of each

CONCRETE LIGHTING POLE WITH GUIDE ARMS

guide arm, thus illuminating the arms completely at night. The pole is being placed on the market by the Auer Concrete Guard Rail Company, White Plains, N. Y.

Push-Button Control System for Cylinder Printing Presses

The important features of a newly developed printing-press control system which is being manufactured by the Kimble Electric Company of 634 Northwestern Avenue, Chicago, may be summarized as follows: Pre-set inching torque, pre-set running speed, dynamic braking on all stops, no-voltage release, wide range of speed control subdivided into small steps, and avoidance of waste of electrical energy at reduced speeds.

The equipment includes a single-phase series neutralized-type motor, a control panel containing an auto-transformer and other auxiliaries, and the required number of push-button stop stations. On the control panel are two dials for speed control, one giving speed changes in large steps and the other in small steps, so that a very wide speed range is available by very small steps.

FIG. 1—MAIN CONTROL STATION, SHOWING FLUSH STARTING AND PROJECTING STOP BUTTONS, AND CONTACTORS

The speed can be regulated while the motor is running or can be pre-set for any particular job and not disturbed during the entire run. By this system the motor always starts with the same amount of torque regardless of the position of the speed-control levers on the magnet-switch panel. The torque with which the motor starts may be regulated by transferring an adjustable wire *W* on the switch panel from one stud to another on the speed-control dial.

There are three buttons in the main station, the "inching" button, the "run" button and the "stop" button. Pressure on the inching button starts the press, which runs as long as the button is pressed, and upon release is stopped by dynamic braking. All stops are dynamic-brake stops, whether the stop is caused by pressing any of the stop buttons or by failure of the supply voltage, or from any other cause. The speed or torque of the motor when inching is capable of adjustment to suit individual conditions, a stronger torque

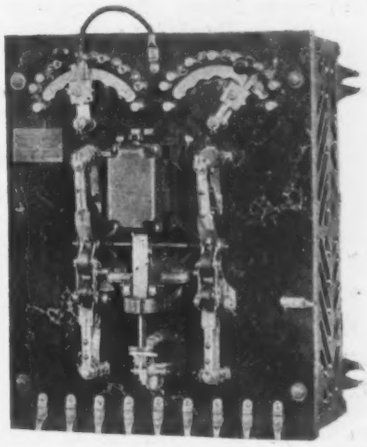


FIG. 2—CONTROL PANEL, SHOWING SPEED-CONTROL LEVERS AND MAGNET SWITCH

being desirable in some cases than in others. The adjustment of the torque of the motor when inching is distinct from the adjustment of the running speed, neither of these adjustments dis-

turbing the other. With this arrangement it is possible to use a heavy motor torque for starting, without regard to the motor torque required for running, which latter may be much heavier or lighter than that required for starting.

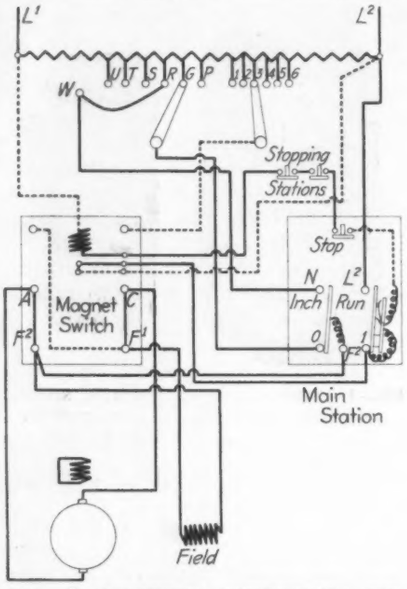


FIG. 3—COMPLETE CONNECTIONS FOR INCHING, RUNNING AND STOP PUSH-BUTTON CONTROL

Pressure on the running button starts the press with the same motor torque as that obtained when the inching button is pressed, this torque continuing to act as long as the running button is held closed. When the run button is released the torque of the motor changes from the pre-set starting value to the pre-set running value, and the printing press then runs at the pre-set running speed.

Pressure on the "stop" button stops the press, the motor giving a very powerful dynamic braking action. Rough tests have shown that a 19-in. by 28-in. press running 3000 impressions a minute is stopped by the dynamic brake in about one-half turn. The stop button projects above the others so that a random swing of the operator's open hand against the group of buttons is all that is necessary when making a stop. The feature of no-voltage release is included; if the supply voltage is interrupted for any cause, the motor will not re-start when the service is restored until the operator presses the buttons.

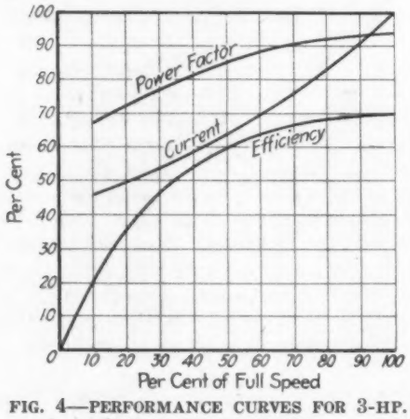


FIG. 4—PERFORMANCE CURVES FOR 3-HP. SINGLE-PHASE MOTOR

Any number of additional stopping stations or automatic printing-press stops such as "ball-up" stops or "two-sheet" stops, "no-sheet" stops and cross-wise stops may be employed. If desired the stopping stations can be made to lock in the off position, thus providing a further safety-stop feature.

RECORD OF TEST ON 2-HP., 1800-R.P.M., SINGLE-PHASE, VARIABLE-SPEED MOTOR EQUIPPED WITH STANDARD AUTOTRANSFORMER CONTROL

Position of Controller		Volts	Amperes	Watts	R.p.m. of Motor	Impressions per Hour of Press	Power Factor, per Cent
Auxiliary Handle	Main Handle						
1	1	230	3.00	620	600	936	89
1	2	230	4.00	700	700	1093	76
1 No air	3	230	5.00	800	800	1250	70
1	4	230	5.13	910	940	1469	77
1	5	230	5.25	1020	1040	1625	85
1	6	230	5.37	1140	1160	1812	86
2	1	230	5.13	910	940	1469	77
2	2	230	5.25	1020	1040	1625	85
2 No air	3	233	6.00	1140	1160	1812	80
2	4	228	6.13	1240	1220	1906	88
2	5	228	6.75	1320	1260	1985	87
2	6	227	7.50	1440	1280	2000	84
3	1	230	6.25	1200	1240	1937	83
3	2	228	6.75	1320	1300	2030	85
3 Air	3	228	7.25	1480	1380	2156	89
3	4	226	7.75	1560	1420	2219	89
3	5	226	8.25	1680	1460	2280	90
3	6	226	8.75	1800	1500	2340	90
4	1	227	7.75	1560	1420	2219	88
4	2	228	8.25	1660	1440	2250	89
4 Air	3	227	8.75	1800	1500	2340	90
4	4	227	9.25	1940	1580	2469	92
4	5	225	10.00	2060	1640	2562	91
4	6	225	10.75	2220	1680	2625	90
5	1	226	9.25	1920	1500	2340	91
5	2	226	9.75	2000	1580	2469	95
5 Air	3	224	10.50	2160	1660	2594	92
5	4	224	11.00	2260	1740	2719	92
5	5	224	11.75	2400	1780	2780	91
5	6	220	12.50	2580	1820	2843	94

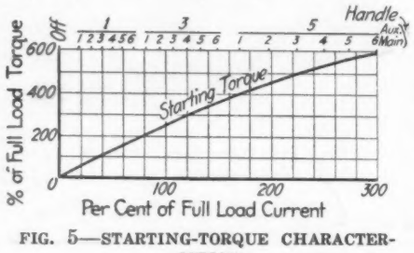


FIG. 5—STARTING-TORQUE CHARACTERISTICS

The speed of the motor is regulated by varying the voltage applied to it, this voltage being in turn controlled by means of the auto-transformer mounted on the back of the control panel. This method of control does not involve the loss of energy in resistances and is therefore economical. The over-all efficiency of the drive at full speed is high because the system of control avoids resistance losses.

The single-phase motor used with this system operating on a sixty-cycle circuit can develop full-load starting torque with a starting current of about 40 per cent of full-load current, and can develop other values or torque with currents about in the same proportion. When the motor is operated on twenty-five-cycle energy the ratio of starting current to running current is even lower. This advantage of low-starting current is, of course, desirable from the standpoint of the press owner since it means a saving in electrical energy, and from the standpoint of the power company since it means comparative freedom from the voltage disturbances ordinarily caused by the starting of motors and makes it possible to install these motors on circuits where three-phase motors could not be employed.

Conduit Fittings

A new type of conduit fitting designated by the manufacturer, Charles G. Robin, 48 Warren Street, New York, as a "C.G.R. pipelet" is shown herewith and is designed for use at the ends of exposed iron conduit or BX cable for separating and insulating the wires as they leave the conduit. The manufacturer also points out that it may be utilized for all combination work, motor installations, meter loops or wherever a "condulet" is necessary. The device is being made in three sizes—½ in., ¾ in. and 1 in.—all of which are designed to accommodate three wires.

FITTING FOR USE ON END OF EXPOSED CONDUIT

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Date for Annual Meeting of Associated Manufacturers of Electrical Supplies

The annual meeting of the Associated Manufacturers of Electrical Supplies will be held on March 16 in New York City. In the afternoon at 2 o'clock the business session of the meeting will be called at the Hotel Biltmore, New York City. The executive and associate representatives of member companies have been asked to attend this session in order that the important matters to be presented at the first annual meeting of the association may receive consideration by all its membership. After the business session of the association, at which is to occur the election of new members to the board of governors, the regular organization meeting of the board of governors will be called. The evening session will be a social event, with dinner, speakers, music, etc.

Illinois Association to Do Intensive Work

The delegates to the Illinois State Electric Association convening at Champaign, Ill., Feb. 23 and 24, held one executive session in addition to carrying out the scheduled program. At that meeting it was the consensus of opinion that the association had not been performing for the industry many things which a well-conducted association can do. With the end in view of learning what a State association can do and how it can do it, D. L. Gaskill of Greenville, Ohio, secretary-treasurer of the efficiently operated Ohio Electric Light Association, was asked to tell the delegates about the constructive work that has been done and is being done by the Ohio association. Acting upon this invitation, Mr. Gaskill delivered a forceful and instructive talk, pointing out what he considered to be the elements of success in association building.

Following Mr. Gaskill's talk, the executive committee of the Illinois association was instructed to revise the organization's constitution and by-laws at an early date. At the same meeting the following officers were elected for the ensuing year: President, R. S. Wallace, Peoria; vice-president, Harry O. Channon, Quincy; secretary-treasurer, R. H. Abbott, Petersburg; executive committee, E. MacDonald of Lincoln, H. E. Chubbuck of Peoria, Frank J. Baker of Chicago, J. J. Frey of Hillsboro, and E. W. Smith of Kewanee.

The technical part of the program consisted of five papers—"Boiler Efficiency," "Electric Cooking," "Voltage Regulation," "Rate Schedules," and "Steam-Heating Plants."

Speaking on "Voltage Regulation," Prof. Ellery B. Paine of the University of Illinois pointed out some of the factors that determine regulation and cited some of the fundamental theories useful in calculating distribution-line characteristics.

Prof. Morgan Brooks of the University of Illinois, in a paper on "Rate Schedules for Towns of 2500 or Less," declared that electrical rates should be simplified. As a substitute for lighting-rate schedules which base their readiness-to-serve charge on the number of sockets Professor Brooks suggested a schedule basing that charge on the floor area to be lighted. His position in this matter was sharply attacked by Martin J. Insull and John G. Learned of Chicago and others. It seemed to be the consensus of opinion of operating men that the establishment of any rate schedule must be accompanied by much educational work to show the public the justification of the rate.

A paper by H. R. Wetherall of Peoria, Ill., entitled "Are Steam-Heating Plants Profitable?" set forth the opinion that with proper rates, conditions and management central-station heating business can be operated conjointly with electric lighting on a paying basis in towns of more than 5000 population.

The convention was attended by about seventy-five central-station men. The attendance at the annual banquet was about 175.

Power Company Forms Electric-Furnace Company to Increase Load-Factor

In order to utilize the present off-peak power and the additional off-peak power which will come with the contemplated increase in the company's plant, the Pennsylvania Water & Power Company, which supplies the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., with power, has formed the Shawinigan Electro-Products Company. This company, which is chartered in the State of Maryland for the purpose of manufacturing and selling electric-furnace products, has purchased property adjoining the property of the Baltimore substation, and a 10,000-hp. electric furnace plant has been erected and was put in operation Dec. 22. The capacity of the furnace is 30 tons a day or 10,000 tons a year, and contracts have already been signed for 6000 tons to be delivered during 1916 to domestic concerns. The foreign demand is so great that every ton produced can be sold at a handsome profit. The gross earnings from power used will approximate $150,000.

In connection with the investigation that resulted in the Shawinigan company being formed, Charles E. F. Clark, president of the Pennsylvania Water & Power Company, says:

"In order to provide for the requirements of customers it is necessary to install a sufficient amount of equipment to take care of their extreme or peak demand, consequently a large proportion of capital investment is unremunerative during quite a portion of each year—a condition which is common with all power companies. Obviously, the ideal condition would be to have a 100 per cent load-factor, or the invested capital remunerative every hour of the day throughout the year. The management of the company has given much study along this line and finally determined that the development of electric-furnace usage was the natural means for producing the desired results.

"Investigation also disclosed that these electric furnaces should be operated by the power company, as it would be quite impossible to contract with outside capital for power, owing to the necessity of electric-furnace power being used as and when the power company sees fit for its best purposes. It develops, therefore, that electric-furnace operation is a natural adjunct of the

power business, as it is the best-known method of utilizing off-peak power.

"Various ferro-alloys and other materials are made most successfully in the electric furnace, and after careful investigation as to tonnage, raw material, freight rates and market, the company decided upon the manufacture of ferro-silicon."

Public Service Commission News

Idaho Commission

Called upon to determine which one of two applicants for a certificate of convenience and necessity to install a gas plant in the city of Idaho Falls should have preference, the Public Utilities Commission of Idaho has decided in favor of William D. Wilcox, representing Chicago capital, as against J. A. Jones. The latter applicant failed to present a definite and tangible plan. Mr. Wilcox did so, yet Mr. Jones filed the first application for the certificate or right to enter the field. "We are met at the threshold," says the commission in its order, "with the proposition as to what weight should be given the application of Jones by reason of its priority alone. If all other conditions and facts surrounding the two applications were equal, then the preference should be given to the party first making proper application therefor. The policy of this commission is now and has been ever since its establishment that public utilities of this character should have a monopoly of the field so long as they give the public adequate service at reasonable rates. In fact, we feel confident that neither of these applicants would desire a certificate if he felt that the right were going to be granted to both. . . . The controlling factor in a controversy of this kind is the public convenience and welfare. Making a concrete application of that rule to the present proceeding, the question naturally arises: Which one of these applicants will be able to render the best service to the public?" The commission then casts its lot with Mr. Wilcox. He is to have till June to commence work and until October, 1917, to complete the gas system ready for service to consumers.

The commission has conducted a hearing into the application of the city of Pocatello for a certificate to install a municipal water system and has permitted the Pocatello Water Company to intervene. This case is one that represents a long-drawn-out fight between the city and the water company, formerly owned by James A. Murray of Butte. He is said to have transferred his interests to Alexander Murray. Shortly after the commission was created it handed down an order directing the water company to make improvements costing more than $100,000. An appeal from the order was taken to the Supreme Court, and the tribunal reversed the commission's findings in a celebrated opinion. Since then the city has come in and asked for a certificate to install a municipal plant, having failed in negotiations to purchase the company's system.

Arizona Commission

Adding its weight to the decision previously made by other commissions, the Arizona Corporation Commission has decided that a public-service company must furnish service upon request under normal conditions. Accordingly the Miami Electric Power Company will be compelled to furnish electrical service to the residents in the Live Oak and the Inspiration additions to the town of Miami.

Several weeks ago a number of the residents of those additions filed a complaint with the commission, stating that the service company had refused to extend its wires to those sections and that it had repeatedly refused to supply service to the petitioners. The company, it appeared, had laid out the original town site of Miami, and did not care to furnish power to or recognize in any way the the several additions which had been laid out subsequent to the establishment of the original town. The members of the commission held that as the power company was to be regarded as a public-service corporation, there was no reason why it should not extend its lines to the additions which had been laid out adjoining the city of Miami. The electric company is given until March 10, 1916, in which to comply with the commission's order.

Wisconsin Commission

The Janesville (Wis.) Electric Company, having abandoned direct-current service in certain sections of the city, is ordered to purchase all direct-current equipment rendered useless at a price to be ascertained by methods prescribed in the order, or to reimburse each consumer for the difference between the prescribed price and the sum actually received for the equipment when sold by the consumer.

New York Commissions

The Public Service Commission for the Second District has approved the application of the Depew & Lancaster Light, Power & Conduit Company for permission to extend the life of its franchise from 1946 to 1956. This step was taken so that the life of some of the company's securities might not exceed the life of the franchises.

Connecticut Commission

The Public Utilities Commission of Connecticut has issued the following order: "Each utility owning or having the custody and maintenance of a pole or other structure used for supporting electrical conductors shall on or before Oct. 1, 1916, mark said pole, post or other structure with a designating mark or symbol indicating the utility so owning or having the custody and maintenance thereof and a number by which the location of each pole or structure may be described; provided, however, that such utilities will not be required to mark more than every fifth pole upon a through or trunk line of poles in a rural district, and provided further, that the mark of no utility other than the one owning or having the custody and maintenance shall be required on jointly used poles."

Missouri Commission

The Missouri Public Service Commission has granted the request of the Southwestern Telephone & Telegraph Company (the Bell company) to put into effect on April 1 a modified schedule of increased rates on business telephones in St. Louis. The schedule will be tried for a year to determine whether under it the company can obtain the increased revenue it holds is necessary. The modified schedule increases the unlimited service direct telephone rate from $78 to $96 a year. Discussing the increased rates, the commission said: "A commendable feature of the modified schedule is that, while it increases certain rates, the increase is confined to the subscriber who makes a large and valuable use of the telephone."

Indiana Commission

Chairman Thomas Duncan of the Indiana Public Service Commission has made public a summary of the forthcoming report from the commission, the first in two years, in which many pertinent references to the work of the commission among the electrical utilities of the State were made. The report, it was stated, will show among other things that the commission since it became operative in 1913 has authorized the issuance of more than $30,000,000 in utility securities.

Children in Illinois Town Taught to Read Meters.—Pupils in the grade schools of Freeport, Ill., are taught how to read gas and electric meters and figure out how much the bill will be.

Pennsylvania Capitol to Be Flood-Lighted.—The Capitol building of the State of Pennsylvania at Harrisburg, following the lead of other state capitols, will be illuminated in the near future by flood-lighting. The projectors will be mounted on nearby buildings and other points of advantage.

Railroads Get Higher Rates on Small Sizes of Anthracite.—The Interstate Commerce Commission on Feb. 29 modified its order in the so-called anthracite coal case so as to allow the hard-coal-carrying roads slight increases in rates on prepared sizes and on pea and smaller sizes. The increases generally are a few cents a ton and apply to points in New Jersey and New York.

Waits for Trees to Leaf Before Locating Lamps.—In order to view all locations under conditions which demand the maximum and best lighting service, it has been announced that no action on the part of the Worcester (Mass.) street-lighting committee of the City Council toward locating additional arc lamps will be taken until late in the spring, when the trees shall have leafed out.

Troops Guard Power Plants in Canadian Northwest.—A detachment of forty men of the Seventy-second Overseas Battalion are stationed at Bonnington Falls and Trail, British Columbia. At Trail they will provide a military guard for the big smelter of the Consolidated Mining & Smelting Company, and at Bonnington Falls they will furnish a guard for the power plant of the city of Nelson and that of the West Kootenai Power & Light Company.

Development of 400,000-hp. Plant Hinges on Water-Power Legislation.—The development of the Z canyon site on the Pend Oreille River, Wash., it is reported, depends chiefly upon the passage of the Ferris bill, now before the Senate. The exploration work preparatory to the erection of a dam and power plant at this point capable of generating 400,000 hp. is being completed. It is generally supposed that a considerable portion of the power to be generated in Z canyon will be taken by the Chicago, Milwaukee & St. Paul Railway in the electrification of its Idaho & Washington Northern line and other branches.

Municipal Plant Lays Off Employees to Make Up Bond Deficit.—Commissioner of Lighting Davis of Cleveland, Ohio, has announced that 40 per cent of the employees of the municipal light plant will be laid off within the next month. The plant is now loaded to two-thirds of its capacity, he said, and there are 15,000 domestic consumers on the books. The city has no money to make extensions. Mr. Davis said that the ornamental light system down-town cost $125,000 more than the original estimates, and the receipts of the plant had to be used in making up the deficit in the bond issue of $200,000 made to construct the system.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Cleveland Valuation to Be Completed in Two Months.—Valuation of the property of the Cleveland Electric Illuminating Company by the Ohio Public Utilities Commission will be completed in less than two months, it was announced by the secretary of the commission.

Indianapolis to Begin New Four-Million-Dollar Plant at Once.—The first unit for the new four-million-dollar plant of the Indianapolis Light & Heat Company has been contracted for, and the company is making arrangements to start work on the building at once. The first unit, which the company intends to set up as soon as possible, will be an 18,000-kw. turbine. Six of these turbines will ultimately be placed in the new plant, each costing $125,000.

A 4227-Mile Telephone Line, Longest in World, Opened.—The Bell Telephone Company on Feb. 14 successfully opened the Montreal-Vancouver telephone line, said to be the longest ear-to-ear circuit in the world. The line is 4227 miles long, while the New York-San Francisco line recently opened is but 3400 miles in length. The new line does not go direct through Canada, but runs via the following connecting points: Buffalo, Chicago, Omaha, Salt Lake City and Portland, Ore.

To Put Sale of Private Plant Before People at Series of Public Meetings.—At the conclusion of a meeting Feb. 16 of the members of the Westbrook (Me.) Board of Trade and other citizens a committee was appointed to prepare and to present to the citizens of the town a statement upon the discussion of whether the Westbrook Electric Company should be sold to the Cumberland County Power & Light Company, to a local corporation, or to the city. Several public hearings on the matter will be held before it comes before the State Utilities Commission.

Enforced Extension of Service Test Case Before Washington Commission.—Closely following after cases before other state commissions in the matter of enforced extension of services, the Public Service Commission of Washington will hold a hearing in Seattle on March 6 on the complaint of Clarence Hanford of Seattle against the Pacific Power & Light Company and the Black Rock Power & Irrigation Company, who contends that the companies jointly occupy certain power lines near his farm near White Bluffs and that they refuse to extend service to him and his neighbors. The companies have answered that the earnings to be received from the proposed extension would be too small to justify the expenditure. The case is in the nature of a test case.

Akron Electric League to Offer Services as Engineering Corps.—The Akron (Ohio) Electric League has decided to offer its services to the Ohio National Guard as an engineering corps.

Universities of the Middle West to Hear Lectures on Lighting.—A series of lectures on "The Modern Attack on the Lighting Problem" will be delivered before scientific bodies at a number of the leading universities in the Middle West by Dr. Edward P. Hyde, director of the Nela Research Laboratory.

Must Light Signs in Missouri City at 5 P. M.—Joplin, Mo., has adopted an ordinance requiring the illumination of electric signs between 5 p. m. and 10 p. m. and prohibiting the projection of signs more than 2 ft. from the property line. Nearly 100 electric signs are affected by the latter requirement and will have to be rebuilt or removed.

Byllesby Properties Sell 16,469 Household Appliances in Holiday Campaign.—During the recent holiday appliance campaign of the Byllesby properties, which lasted from Nov. 1 to Dec. 31, the sales of electrical household appliances aggregated 16,469, or 1000 more than were sold in the 1914 campaign. Minneapolis led the list with a total of 5334.

Flat Rate for Pumping Would End Pacific Power & Light Rate Fight.—It is reported that, provided the Pacific Power & Light Company, operating in thirty-six towns and cities in eastern Washington, will make a flat rate to those using energy for pumping for irrigation, along the lines decided upon at a meeting of power users recently, the long-drawn-out fight for lower power rates in this section of the country will be ended. If a flat rate for power that is agreeable to both sides can be decided upon, the Public Service Commission has said that it would make that rate its order, and the power company will then dismiss, so far as irrigation power rates are concerned, the appeal from the commission's decision which is now pending before the Thurston County Superior Court at Olympia.

Annual Exhibit of Evening Work at Pratt Institute.—Wednesday evening, March 8, will be observed as "visitors' night" in the School of Science and Technology of Pratt Institute, Brooklyn, N. Y. All the shops, laboratories and drawing-rooms of the school will be open to the public, giving an opportunity to all persons interested in industrial education to observe the students at work in the various courses and to inspect the results and methods as well as the equipment and general facilities of the institute for conducting this kind of industrial training. The school provides instruction in industrial electricity, technical chemistry, mechanical drawing and machine design, strength of materials, stationary engineering and power-plant machinery, etc., and is now giving instruction in its evening courses to more than 1000 men who are regularly employed in various vocations and who use these courses to improve their efficiency.

Negligence for Defective Insulation.—Although by law an electric power company is prohibited from cutting shade trees, the Supreme Court of Washington (153 P. 1054) held that the Pacific Power & Light Company was not relieved from liability for the death of a child from coming in contact with a defectively insulated wire which passed through the top of a tree the child had climbed, where it appeared that the company had permitted the wire to burn the tree.

220-Volt System Dangerous.—In a suit brought against the Lancaster Electric Light Company (181 S. W. 967) to recover for injuries sustained in a fall caused by coming in contact with the company's 220-volt service wires, the Court of Appeals of Kentucky held that, although that voltage would not cause death under ordinary conditions, it is certainly dangerous. The court says: "While such a charge of electricity might not cause death, it is easy to see how it might bring about serious injury. It might cause such a shock as to wreck one's whole nervous system, or it might throw or hurl him against some object which would result in maiming or injuring him for life. Manifestly such a charge of electricity is dangerous."

Assumption of Risk in Inspection.—The Orange Ice, Light & Water Company was held by the Court of Civil Appeals of Texas (181 S. W. 751) not liable for the death of an inspector of service poles who was killed by the falling of a pole against which he had been warned and which he had climbed to adjust a wire. Although the pole, which was of white cedar, had been put in new only some four years before, the inspector had assumed the risk of injury, as the duty of inspecting the pole rested on him. An employer, it was held, is not relieved of the general duty he owes his employee to inspect the place of work to discover dangerous conditions unless by his contract of employment the employee is required to perform the duty of inspection himself and such duty is one of the primary objects of the employment.

Private Contracts Immune from Investigation.—The Supreme Court of Washington, in denying a writ of mandate sought to compel the Spokane & Inland Empire Railway Company to disclose the nature of a private power contract it had with the Washington Water Power Company of Spokane, holds that the Public Service Commission of the State is without power to compel disclosures by public-service corporations of their private contracts. The writ was sought by the Public Service Commission on the ground that it had to know the nature of the private contract as a basis of rate-making. In its ruling the Supreme Court said: "The State has no interest in appellant's gains or losses in its private enterprises. To hold that the commission could figure the appellant's private contracts as a basis for rate-making would in turn compel holding that appellant would be entitled to take from the public enough to make good its losses in its private enterprises."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Contributory Negligence on Part of Electrician.—An experienced electrician employed by the Harbor & Union River Power Company was electrocuted while connecting a motor to the service mains. It was held by the Judicial Court of Maine (95 A. 945) that the administratrix of the estate of the deceased could not recover for his death from the power company, since, by not protecting the exposed ends of the wires with temporary insulation or adopting other safeguards, he was guilty of contributory negligence inasmuch as he knew that the service wires were connected with a high-voltage line and was fully aware of the risk he ran.

The Proximate Cause for Injuries from Wire Struck by Lightning.—A team of horses standing under a telephone wire away to one side of the road, which sagged within 4 ft. of the ground, were killed by lightning which struck the line some 150 ft. distant. The Supreme Court of Kansas (154 P. 242) held that, since the wire was not in itself dangerous to persons or animals using a highway for ordinary purposes of travel, and even though it were held negligent to maintain the wire so close to the ground, this was not the proximate cause of the injury. The injury required a conjunction of conditions and circumstances of an extraordinary nature which it is not reasonable to say a person of ordinary prudence and foresight would have anticipated.

Responsibility for Removing Wires Preventing the Moving of a House.—The moving of a house along a street is, according to the Supreme Court of Minnesota (155 N. W. 1075), not ordinary travel, and the statutory requirements that a telephone company shall erect its lines so as not to interfere with the safety and convenience of ordinary travel does not make it the duty of the company to remove its wires from the street to permit the passage of a house along the street. Therefore, when a house mover with the consent of the company removes such wires to permit the passage of a house, he is acting in furtherance of his own business, not in furtherance of the business of the company, and he is not an employee of the company, but a mere licensee. For that reason it was held by the court that a suit for damage against the company brought by a house mover on the ground that he was an employee of the company and was injured by the breaking of a rotten pole which he had climbed and from which he had cut the supporting wires—the defect in the pole being unknown to the company—was properly dismissed.

Disconnection and Disuse of Line Does Not Relieve Company from Liability.—A telephone company, it was held by the Court of Appeals of Georgia (87 S. E. 766), cannot by ceasing to use a part of its line and disconnecting it relieve itself from the duty of exercising care to prevent injury to others from the disused part. This decision grew out of a case in which a disconnected residential telephone service wire had fallen across a lighting company's live wire and was the cause of the death of a person living in the house to which the telephone connection had originally been made, this person stumbling in the night against the telephone wire, the charged condition of which was unknown to him.

Reasonableness of Ordinance Fixing Rates.—In a case before the Supreme Court of Ohio in connection with the rate for gas in the city of Newark (111 N. E. 150) it was held that before a company may be relieved from compliance with the terms of an ordinance fixing the maximum price for gas which has been regularly passed it must show that the rates so fixed are plainly unreasonable and will result in the taking of its properties without just compensation. In determining whether the price fixed by the ordinance will yield a just compensation, the court held that it should be ascertained whether the net profit from operations at the prescribed rate will produce a reasonable return upon the value of the plant of the company at the time of the inquiry. Where it is not clearly shown that a fixed rate for gas will be confiscatory, the company should be required to abide the test of actual experience under such rates and, when fact rather than prophecy may be obtained, present its case upon such actual facts and conditions as may then be shown to exist.

Duty of Public Service Commissioners.—Where the public service commission has upon proper evidence and after due consideration made an order prescribing certain rates to be charged for services to be rendered by a public service corporation, it is the official duty, it was held by the Supreme Court of Appeals of West Virginia (86 S.E. 666), of the individual members of such commission to compel obedience to such order, if it be not obeyed, by instituting proper proceedings in court. If before instituting such proceedings the individual members thereof should be prosecuted in their official capacity in any courts having jurisdiction for the purpose of having the enforcement of their order enjoined and the same declared null and void, it then becomes their official duty to make defense thereto by all proper and lawful means, and an offer to give money to one of them in order to induce him to give testimony in such case, whether said testimony be for or against, is an attempt to influence a public officer in the performance of his official duty. All the acts of such public service commissioners to be performed in relation to such suits, whether employing counsel or procuring evidence or giving testimony, are official and not private or personal acts.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 575 of this number.

Paterson Jovian League.—The first rejuvenation of the Paterson (N. J.) Jovian League will take place on March 20.

Columbus Jovian League.—A rejuvenation was held by the Jovian League of Columbus, Ohio, on Feb. 18, when about sixty new members were admitted to the order.

Jovian Chapter, Cleveland Electrical League.—The Jovian chapter of the Cleveland Electrical League was addressed at its meeting on Feb. 24 by Richard H. Lee on "Municipal Courts."

Central Electric Railway Association.—The next meeting of the Central Electric Railway Association will be held in Dayton, Ohio, on March 24. Beecher W. Waltermire, chairman of the Ohio Public Utilities Commission, will speak on the subject "State Regulation of Public Utilities."

Schenectady Section, A. I. E. E.—The 170th meeting of the Schenectady Section of the American Institute of Electrical Engineers was held on Feb. 23, when Edward J. Cheney, electrical engineer of the Public Service Commission of the Second District of New York, spoke on "The Regulation of Public Utilities."

Philadelphia Section, I. E. S.—The February meeting of the Philadelphia Section of the Illuminating Engineering Society was held on Feb. 18. A paper on "Tests of Street Illumination" was presented by Preston S. Millar, general manager of the Electrical Testing Laboratories, and was supplemented by demonstrations.

New York Jovian League.—At a luncheon on March 1 the plans preliminary to the reorganization of the New York Jovian League were made and by-laws read and approved. The complete reorganization will be effected at the meeting to be held at the Hotel Martinique on March 15, when officers will be elected and other matters decided.

Newark Jovian League.—Plans for the "national house-wiring campaign" were discussed at the luncheon of the Newark (N. J.) Jovian League on Feb. 24. Representatives from the Public Service Corporation of New Jersey, contractors and manufacturers spoke. The league will appoint a committee to act in co-operation with the Public Service Corporation and the contractors in an endeavor to make the campaign a successful one.

Milwaukee Engineering Society.—Arthur Simon of the engineering department of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., gave a lecture on magnetic solenoid apparatus before the Engineering Society of Milwaukee on Feb. 16. The lecture was concluded by showing a 1000-ft. motion-picture reel featuring two of the Cutler-Hammer high-duty lifting magnets at work in the plant of the Inland Steel Company, Indiana Harbor, Ind.

The Institute of Radio Engineers.—A meeting of the Institute of Radio Engineers was held March 1 at the Engineering Societies Building, New York City, to listen to a paper on "Recent Standard Radio Sets," by Harry Shoemaker. The Marconi Wireless Telegraph Company of America has recently placed on several hundred ships two types of standard radio sets, and Mr. Shoemaker, who is research engineer of the company, described in his paper these sets in complete detail.

National District Heating Association.—Owing to the National Electric light Association having selected for its Chicago convention the same week as had been previously selected by the National District Heating Association for its convention in New York City, the executive committee and the convention committee of the National District Heating Association have changed the date from May 22 to May 16, 17, 18 and 19. The headquarters will be at the Hotel Martinique, corner Thirty-second street and Broadway, New York City. D. L. Gaskill, Electric Building, Greenville, Ohio, is secretary.

Louisville Jovian League.—Frank H. Miller, superintendent of motive power of the Louisville Railway Company, has been elected president of the Jovian League of Louisville, Ky., succeeding Robert Montgomery of the Louisville Gas & Electric Company. Philip S. Pogue, general manager of the Louisville Home Telephone Company, was elected vice-president, and Paul Tafel was re-elected secretary and treasurer. To the board of directors Frank E. Goode, T. B. Wilson, Charles Smith and W. D. Rauch were chosen. Preparations are being made for a membership campaign and a rejuvenation on March 17.

Portland Sections, N. E. L. A. and A. I. E. E.—Edward Cookingham, vice-president of the Ladd & Tilton Bank, and Ben C. Dey, assistant counsel for the Southern Pacific Company, addressed the Portland Sections of the National Electric Light Association and the American Institute of Electric Engineers in joint session in the Electric Building on Feb. 8. Mr. Cookingham discussed two topics. He spoke first on credits and explained how and why a firm basis of credit is absolutely essential for successful conduct of business. His other topic dealt with the financial and economic effects of the war and their relations to the United States. Mr. Dey spoke on "Business Law."

Electrical Piano Makers to Celebrate.—The National Electrical Piano Makers' Association, with headquarters at 29 West Thirty-ninth Street, New York City, has arranged for a country-wide celebration of "Electrical Piano Week" from March 13 to March 18, when the electrically operated player-piano will be brought to the attention of the general public through the medium of window displays and newspaper advertisements. A number of the large central-station syndicates and companies operating in the leading cities have agreed to include advertising matter relating to the electric player-piano in their regular newspaper display space during the week, and many electric-lighting companies will have electric music in their showrooms.

Chicago Sections of Engineering Societies.—A joint meeting of the electrical section of the Western Society of Engineers, the Chicago Section of the Illuminating Engineering Society and the Chicago Section of the American Institute of Electrical Engineers was held at the rooms of the Western Society of Engineers in Chicago on Feb. 28, the general subject of the meeting being "Street Illumination." The papers presented were as follows: "Recent Street-Lighting Problems and Developments," by J. R. Cravath, consulting illuminating engineer; "Some Experiences and Tests in Connection with Chicago Street Lighting," by A. C. King, department of gas and electricity, city of Chicago; "Street-Lighting Plans of Milwaukee," by F. A. Vaughn, engineer, Milwaukee street-lighting survey.

Joint Meeting A. I. E. E. and New York Section A. E. S.—The 319th meeting of the American Institute of Electrical Engineers, which will be a joint meeting with the New York Section of the American Electrochemical Society, will be held in the auditorium of the Engineering Societies Building on March 10. The subject of the meeting will be electrolysis, and two papers will be presented. On behalf of the Institute a paper will be presented by Burton McCollum of the Bureau of Standards and G. H. Ahlborn, entitled "The Influence of Frequency of Alternating or Infrequently Reversed Current on Electrolytic Corrosion." On behalf of the electrochemists a paper will be presented by Prof. William H. Walker of the Massachusetts Institute of Technology, entitled "Electrolytic Corrosion of Metals."

Wisconsin Electrical Association.—The annual convention of the Wisconsin Electrical Association will be held at Milwaukee on March 16 and 17, with headquarters at the Hotel Pfister. The Railroad Commission of Wisconsin will define its attitude toward the security issues and outline the procedure to be followed in making application for an increase in capitalization. A member of the Wisconsin Tax Commission will explain the method of taxation of public service companies and why taxes have been increasing annually. The new schedule of rates for residence electric service now in effect in Milwaukee and the surrounding territory will be explained. A paper will be presented on street-lighting rates and contracts which will state the underlying principles of rate-making and cost accounting for street-lighting service. March 16, the first day, the convention will have a joint session with the Wisconsin Gas Association.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Manufacturing and Industrial

Prices and Financing Hold Back Transmission-Tower Buying

Manufacturers of transmission towers and outdoor substation structures find themselves in the peculiar position of not knowing whether to feel optimistic or pessimistic over the conditions now obtaining in their field. Business, in other words, is both good and bad. Actual orders are few and very little is being done in this line, although one manufacturer actually stated that he is doing a fine business at the present time and when pressed for his reasons for that condition said that it is because money is more plentiful at present. Like the others, he stated that he is looking forward to even better conditions.

The reasons for a lack of present orders reported by the majority of manufacturers interviewed were twofold. First, it was said that although the operating departments of the central stations were anxious to recommend additional transmission equipment, the financial departments were still loath to do any financing for development work that was not absolutely necessary in order properly to take care of present customers. Further, it was found to be very difficult to interest the financial interests just now in any new developments. The bond market is good, better, in fact, than it has been for some time, but Wall Street is advising caution. This financial situation is practically without precedent, and, as pioneers, the moneyed interests feel that it is best to go slowly. Should the development be a hydro-electric one, of course, there is the additional drawback of impending legislation. The other reason offered was the high prices of steel. The price of steel has gone up since early in 1915 from $24 a short ton to $50 a short ton, which was the price early in the week. In other words, steel towers have more than doubled in price in about a year. At these prices light and power companies are not anxious to do much buying, and since they do not feel that these prices will continue indefinitely they therefore feel that they can well afford to wait for better prices. These prices, coupled with the price of copper, which has also doubled in a few months, it is felt, are holding back many orders that otherwise would be quickly given.

There is, however, right now a feeling that business is coming, and coming soon, in considerable volume. It is pointed out that for more than a year and a half there has been practically no purchasing of transmission equipment, and that during those months the light and power industry, as shown by the monthly statistics compiled by the ELECTRICAL WORLD, was growing at a considerable rate, especially in its output for power purposes, since the middle of 1915. It is, therefore, expected that the lighting industry cannot get along much longer without buying a large amount of tower equipment. Moreover, this is the first of the year—the time of annual meetings, the time when budgets are presented and when appropriations are made and expenditures sanctioned. With a knowledge of these facts the manufacturers are hopeful. There is not much hope, however, to be had from new developments, for it is pointed out that there is little work being done by the consulting engineers and that the new plants now being built can almost be counted on the fingers of one's right hand.

The greatest business that will come, therefore, will be from two directions—first, from existing companies for reconstruction and for new business, and, second, from mergers and acquisitions necessitating transmission lines either to tie up the plants included in the merger or to distribute energy from one central plant to the territory formerly served by the individual plants in the merger.

In spite of the fact that steel is now so hard to get, deliveries are good. In fact, if the customer is willing to pay a large enough premium he may have his towers at almost any reasonable time he wishes to name. Deliveries are good because there is nothing special in tower-construction work. It is straightforward work and can be turned out in a hurry. Another thing in its favor is the small use of steel plates. Anything requiring an extensive use of steel plates is bound to be very much delayed in delivery.

The Terry Steam Turbine Company, Hartford, Conn., has moved its Chicago office from Room 524 Monadnock Building to Room 403 Monadnock Building.

The Duncan Electric Manufacturing Company, Lafayette, Ind., has moved its New York office from 114 Liberty Street, where it has been during the last four years, to 500 Fifth Avenue, Room 505.

W. H. Quirk, for several years stores manager for the Western Electric Company at Kansas City, and recently occupying the same position at the Dallas branch, has been transferred to like duties at the Cleveland house of the company.

Frederick Riebel, Jr., former manager of the Westinghouse Electric & Manufacturing Company's branch sales organization at Omaha, Neb., has taken a position in the sales department of the George Cutter Company at South Bend, Ind.

The Usona Manufacturing Company, 1 Hudson Street, New York, has appointed W. F. Georges, for seven years with the Western Electric Company, a member of its sales force, and he will cover the territory embracing New Jersey and Pennsylvania.

The Electric Brush Company, Dover, N. J., has recently been formed for the purpose of manufacturing brushes which are to take the place of worn-out brushes on automobile starting and lighting sets, magnetos and electrically operated horns. Eventually the company expects to interest manufacturers of these devices in its brushes.

Range Company Makes Wiring Accessible.—The Globe Stove & Range Company of Kokomo, Ind., has adopted the practice of attaching the top part of its B type electric ranges to the bottom portion by a set of hinges placed just above the oven door. The top part of the stove may be tilted forward on these hinges to expose the entire wiring system of the stove and the terminals of the heating elements.

Beardsley Company Elects Officers.—The Beardsley Electric Company, Culvert City, Cal., manufacturer of electric vehicles, recently elected the following directors: H. H. Culver, V. S. Beardsley, R. H. Raphael, C. H. Warner, C. H. Sorg, L. M. Welsh and J. T. Shannon. V. S. Beardsley was elected president, H. H. Culver and R. H. Raphael vice-presidents, and Arthur Wright secretary. J. T. Shannon was appointed production superintendent.

British Manufacturers Form Combination for Obtaining Business in Russia.—The Electrical Manufacturers' Company of Great Britain, Ltd., has recently been formed for the purpose of exploiting British electrical products in Russia. A large number of English firms are interested in the new company, the purpose of which is to unite a group of manufacturers producing various kinds of electrical supplies so that large contracts can be made without the necessity of making sub-contracts.

New Electric Plant to Prove Boom for Region of High-Priced Commodities in Colombia.—Frank H. Roth, chief engineer of the Palmira Electric Company, Palmira, Departmento del Valle, Colombia, S. A., states in a recent letter to

the ELECTRICAL WORLD that he has just completed a small high-tension hydraulically operated plant, which in the very near future will be able to transmit power to the various small towns in the rich valley in which it is situated. Mr. Roth says that in this region an ordinary "penny" candle costs 5 cents, a gallon of kerosene $1.25, and a gallon of gasoline $2. He also declares that coal is out of the question and that people would not know how to use it if they could get it, and that kindling wood as now sold is worth about $40 a cord. Electrical energy will be especially in demand, therefore, for cooking and heating. Mr. Roth asserts that his company will be in the market in the immediate future for electric automobiles, charging apparatus, cooking utensils of every description, storage batteries, electrically operated fans, and electrical supplies of all kinds.

General Electric Company to Have Exhibit at National Railway Appliances Association Convention.—The General Electric Company, Schenectady, N. Y., has prepared a very interesting exhibit of its railway-appliance products for the National Railway Appliances Association convention to be held in the Coliseum, spaces Nos. 150-151, at Chicago, March 20 to March 23 inclusive. Among the most interesting apparatus to be exhibited by the company will be the following: PenDell automatic substation equipment for maintaining a continuous supply of power on a transmission line or a service line when two or more sources of electric supply are available; a standard section-type switchboard for electric garages, train-lighting and baggage-truck charging and general battery-charging purposes; vacuum-tube lightning arresters, a display of enameled resistance units, indoor and outdoor air-cooled transformers for low-voltage signal lighting, and portable testing instruments. Among the well known General Electric men in attendance will be W. O. Kellogg of Philadelphia, W. J. Clark of New York, W. H. Sigourney of Cincinnati, B. F. Bilsland and S. W. McCune of Chicago, H. M. Jacobs and John Roberts, and L. W. Shugg of Schenectady, in charge of the exhibit.

Large Decreases in Canadian Electrical Imports, Mostly in American Goods.—Comparative figures showing the imports of electrical goods into Canada for the years ended March 31, 1914 and 1915, together with that part of the imports manufactured in the United States, appear in the accompanying table. The 1914-1915 imports decreased by $4,390,000, or 33.7 per cent. Of this total decrease of $4,390,000, it will be noted that $3,653,000, or 83.2 per cent, is attributed to a decrease in the export of electrical goods manufactured in the United States. It will be noted from the column showing the percentage of the total decrease from the United States that in certain articles the decrease was over 100 per cent. This comes from the fact that certain other countries made increased exports to Canada, so that the decrease in goods of United States manufacture was in those instances greater than the total decrease for that product. The figures for 1913-1914 include none of the war months, while the figures for 1914-1915 include the first eight months of the war. Moreover, the close of the 1914-1915 period was some months previous to the industrial revival which was put in motion by the large orders from Europe for war munitions. No figures are available, however, for later months, and it is not known therefore to what extent, if any, the imports into Canada of goods manufactured in the United States have increased. It is sufficient to point out, however, that while the United States was the heaviest loser in the decreased Canadian imports, nevertheless the ratio of goods of United States manufacture to the total imports increased slightly, from 84.5 per cent to 85.2 per cent.

RELATION OF AMERICAN ELECTRICAL EXPORTS TO CANADA TO TOTAL CANADIAN ELECTRICAL IMPORTS

Articles	Total Imports		Imports from United States		Decrease in Imports from United States		
	1913–14	1914–15	1913–14	1914–15	Total	Per Cent	Per Cent of Total Decrease
Copper wire	$116,000	$25,000	$115,000	$23,000	$92,000	80.0	101.0
Carbons	89,000	44,000	39,000	36,000	3,000	7.7	6.7
Incandescent lamps	132,000	70,000	110,000	54,000	56,000	51.0	90.5
Insulators, batteries, telegraph and telephone instruments	6,597,000	4,344,000	5,515,000	3,675,000	1,840,000	33.4	81.8
Gasoline engines	2,570,000	2,034,000	2,457,000	1,905,000	552,000	22.3	103.0
Steam engines	455,000	237,000	386,000	170,000	216,000	56.0	99.2
Steam boilers	385,000	198,000	273,000	163,000	110,000	40.3	59.0
Motors and generators	1,807,000	1,349,000	1,542,000	1,146,000	396,000	25.7	86.5
Insulated iron wire and cable	878,000	338,000	563,000	175,000	388,000	69.0	72.0
Total	$13,029,000	$8,639,000	$11,000,000	$7,347,000	$3,653,000	33.2	83.2

The John O. Heinze Company, Springfield, Ohio, manufacturer of electrical apparatus for automobiles, was formed in July, 1915, with a capitalization of $500,000, and is now maintaining a factory having approximately 100,000 sq. ft. of floor space. The building is of reinforced-concrete construction and is equipped with modern machinery, including besides the usual machines and punch-press equipment a complete line of apparatus for heat treating, coil winding and armature winding and impregnating. The officers of the company are: William Pflum, president and general manager; John O. Heinze, vice-president and chief engineer, and Ralph B. Miller, secretary-treasurer. Mr. Pflum was formerly vice-president and general manager of the National Cash Register Company of Dayton, Ohio, and Mr. Heinze, who has designed the products which the company is manufacturing, was formerly chief engineer of the Northway Motor & Manufacturing Company, which is a subsidiary concern of the General Motors Company. The above-mentioned three men, together with A. F. Knobloch, general manager of the Northway Motor & Manufacturing Company; B. J. Westcott, treasurer of the American Seeding Machine Company of Springfield, Ohio, and E. L. Shuey, advertising manager of Lowe Brothers, Dayton, Ohio, make up the board of directors.

Manufacturer Announces Change in Sales Policy.—Until recently the Oshkosh (Wis.) Manufacturing Company sold its products, which are tools for construction work, both to electrical jobbers and to ultimate consumers. The consumers generally were central stations and telephone companies. Now, however, the Oshkosh company has announced that in the future its goods will be marketed entirely by electrical jobbers. The announcement of this policy, according to J. W. Wooley, sales manager for the company, was made only after a thorough study of both sides of the question. "In this study we found," said Mr. Wooley, "that the average amount of an order from an operating company was only a small fraction of the amount of an order from the jobber, but that the cost of filling each order was the same. While a little time was saved in assembling the smaller order of tools, the saving was lost in the increased ratio of cost of special packing cases, etc. A large percentage of orders came to us from operating companies that were unfamiliar with our catalog numbers. This necessitated further correspondence and incident delay in shipment while ascertaining what the company required. Orders for 80 lb. or 90 lb. of tools formerly came to us from companies 2000 miles distant. This meant proportionately an immense freight item in view of the fact that the weight of the single order was much smaller than the weight allowed under the minimum freight charge. Investigation of several hundred orders showed that an average of 12 per cent on the total cost of the tools could have been saved by the consumer had he been able to specify enough tools to make his order reach the minimum weight required by transportation companies. For these same orders it was

found that the average time from date of shipment to date of delivery was nine days. Again there was sometimes further delay because we were so far away from the operating companies which were ordering that no accurate credit rating could be obtained. To summarize, we have decided to make the change because, first, our selling expense except for advertising will be practically nothing; second, the jobber can and does pack tools for shipment so that the shipping charge is divided between several items of which the tools are a small proportion; third, we shall have no credit losses, and, fourth, we believe a jobber who will maintain a large and representative stock near the consumer can sell tools to the consumer, the operating company, at a lower cost than we could by selling direct. Besides all this, the jobber will be able to reduce delays in shipments and to give purchasers better service."

NEW YORK METAL MARKET PRICES

	Feb. 21 Selling Prices Bid	Asked	Feb. 29 Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	108 0 0		105 10 0	
Prime Lake	28.00	to 28.50†	28.25	to 28.50†
Electrolytic	28.00	to 28.50†	28.25	to 28.50†
Casting	26.50	to 27.00†	26.75	to 27.00†
Copper wire base	29.25	to 29.75†	29.25	to 29.75
Lead	6.30		6.30	
Nickel	45.00	to 50.00	45.00	to 50.00
Sheet zinc, f.o.b. smelter	25.00†		25.00	
Spelter, spot	20.92½	to 21.17½†	20.55	to 20.80†
Tin, Straits	42.25		48.00	
Aluminum, 98 to 99 per cent.	56.00	to 58.00	58.00	to 59.00

OLD METALS

Heavy copper and wire	22.50	to 23.00†	22.00 to 22.50†
Brass, heavy	14.00	to 14.75†	14.00 to 14.25†
Brass, light	12.00	to 12.50†	12.00 to 12.50†
Lead, heavy	5.25	to 5.40†	5.25 to 5.40†
Zinc, scrap	15.00	to 15.50†	15.00 to 15.50†

COPPER EXPORTS

Total tons to Feb. 29	20,548

†Nominal.

Corporate and Financial

Commonwealth Edison Company, Chicago, Ill.—The stockholders at the annual meeting held Feb. 28 voted to increase the capitalization by $10,000,000. The total amount of the capital stock when the new issue has been made will stand at $60,000,000.

Kansas City (Mo.) Light & Power Company.—The Missouri Public Service Commission has granted the application of the company to issue $3,060,000 of bonds under the first mortgage and $1,917,000 under the second mortgage.

Narragansett Electric Lighting Company, Providence, R. I.—An issue "at discretion" of new capital stock, on convertible debentures, to the amount of $1,500,000 or any part thereof, was authorized by the stockholders at the annual meeting. There is no expectation of an immediate issuance, but the action was taken at this time so that another meeting of the stockholders should not be necessary during the year. At present there is an issue of $1,000,000 of convertible debentures outstanding which will mature July 1 this year. Their conversion in July or before that time will increase the capital stock to $8,000,000. The authorized capital limit is $10,000,000.

National Carbon Company, Cleveland, Ohio.—The directors have decided to increase the quarterly dividend rate on common stock from 1.5 per cent to 2 per cent. The first payment on the new basis will be made April 15 to stockholders of record of April 5. There is said to have been some disappointment among stockholders who anticipated a large extra dividend, but President Parmelee has explained that it is desirable to have an increased amount of working capital at this time.

Niagara Falls (N. Y.) Power Company.—During the first half of the year, it was stated in the annual report of the company for the twelve months ended Dec. 31, 1915, earnings continued to be affected adversely by the depression in business. A marked reversal of this condition occurred later, which particularly affected important industries served by the company. The demand for a larger output of their several products not only required power at the time of peak loads to the full extent of the permitted output of the generating companies, but served as well to increase the use of power at other times. This resulted in a higher load-factor and increased sales of power. Gains in earnings were sufficient to overbalance earlier decreases and to furnish substantial grounds for anticipating the re-establishment of the continuity of yearly increases shown prior to 1914. The great basic industries domiciled at Niagara Falls and using power are now applicants for further blocks of power which under existing restrictions cannot be furnished. During the year the Canadian Niagara Power Company began the work of installing in its completed power house in the Queen Victoria Niagara Falls Park three additional 12,500-hp. generating units. The necessary alterations in the wheel-pit, including rock excavation, concrete invert, masonry walls, concrete foundations and draft tubes, are now practically completed on schedule time. The delivery of turbines has been somewhat delayed, but it is expected that shipments will begin shortly, and that thereafter the work of installation will proceed continuously until the new units are completed. The combined comparative income account of the Niagara Falls Power Company and the Canadian Niagara Power Company for 1914 and 1915 follows:

	1915	1914
Sales of electric energy	$2,536,757	$2,456,734
Miscellaneous	148,841	179,297
Total operating revenue	$2,685,598	$2,636,031
Operating expenses	$467,854	$473,196
Amortization	120,000	100,000
Operating taxes	200,906	200,287
Total deductions from operating revenue	$788,760	$773,483
Net operating revenue	1,896,838	1,862,548
Rent revenue	$39,239	$38,064
Interest	145,108	64,057
Dividends	.....	18,830
Miscellaneous	2,213	1,879
Total non-operating revenue	$186,560	$122,830
Miscellaneous	$8,000	$6,162
Non-operating taxes	12,712	13,278
Total non-operating revenue deductions	$20,712	$19,440
Net non-operating revenue	$165,848	$103,390
Net income	2,062,686	1,965,938
Interest on funded debt	$994,760	$994,760
Miscellaneous	980	1,635
Paving Buffalo Avenue	38,889	.....
Total deductions	$1,034,629	$996,395
Surplus	1,028,057	969,543

Pine Bluff (Ark.) Company.—A new issue of $700,000 of first mortgage 5 per cent gold bonds due Jan. 1, 1942, is being offered at 92 and interest to yield approximately 5.55 per cent.

United Gas & Electric Corporation, New York, N. Y.—An issue of 6 per cent thirty-year collateral-trust sinking-fund gold bonds due April 1, 1945, is being offered at 97 and interest.

Washington Water Power Company, Spokane, Wash.—The dividend rate in 1916, it was stated by President D. L. Huntington in his annual report, will not be less than 4 per cent. The report further states that the total output for the year was 165,913,500 kw.-hr., a decrease from 1914 of 22 per cent. Very little construction work is contemplated in 1916. The principal items for the electric light and power system are for transformers, meters and minor extensions from present lines when required to take on additional business. The revenue from power in the Cœur d'Alene mining district was seriously affected owing to the loss of business through competition and reduction in rates upon that remaining. The great activity in mining during the year, however, did much to reduce these losses. Much new business was taken on, and there are other contracts which will become operative in 1916. Some of these new contracts are with mines, which, it is thought, may develop into important customers. Lighting and power revenues in the country districts showed a moderate increase, but in Spokane there was some decrease for the year due to rate reductions made in July, 1914. December, 1915, however, showed a slight increase over December, 1914. It is too early, the report states, to predict accurately the results to be expected from the state-wide prohibition law which became effective Jan. 1, 1916. It is most probable that for a time at least some decreases in revenue must be expected from this cause. The new power plant at Long

Lake has machinery now installed to supply 33,000 hp., some of which will be needed for the normal growth of the company's business. Railroad electrification, mining and smelting of metals present possible fields for future sale of electric power in large quantities, although at low prices, and the company will endeavor to secure some portion of such business. The results of the company's business in 1915 are shown in the following statement of earnings:

Gross operating revenue		$2,743,876
Receipts from interest on current balances		6,609
Total revenue		$2,750,485
Operating expenses, including taxes		1,239,505
Net operating earnings		$1,510,980
Interest on bonds	$249,098	
Interest on notes and loans	191,774	
Premium on bonds bought for sinking fund	1,594	
Annual credit to amortization fund for discount on first refunding mortgage bonds	8,000	
Interest on consumers' deposits, etc	1,564	
Written off for replacement reserve	325,000	
Uncollectible accounts, etc	10,293	
		787,323
Net earnings		$723,657
Surplus from 1914		1,118,688
Total		$1,842,345
Dividends paid	$851,950	
Adjustments prior to 1915	3,450	
		855,400
Surplus Dec. 31, 1915		$986,945

New Utility and Industrial Companies

The Central Electric Construction Company of Louisville, Ky., has been incorporated with a capital stock of $1,000 by H. Netherton, A. R. Hudson and W. H. Crutcher.

The Durbin Company of New York, N. Y., has been incorporated to manufacture and deal in electrical appliances, etc., by J. N., P. C. and W. L. Durbin, 8 Nagle Avenue, New York, N. Y.

The Alamo Farm Light Plant Company of Dubuque, Iowa, has been incorporated with a capital stock of $10,000. The officers are: B. J. Schwind, president; A. J. Jaeger, vice-president, and B. J. Schwind, Jr., secretary.

The Basco Electric Light & Power Company of Basco, Ill., has been incorporated by August Ancelet, William O. Fisher, L. B. Fisher and S. Ancelet. The company is capitalized at $5,000 and will operate an electric-light plant in Basco.

The X-Ray Reflector Company of New York, N. Y., has been incorporated by A. D. Curtiss, E. L. Haines and R. B. Corby, 611 West 158th Street, New York, N. Y. The company is capitalized at $35,000 and will manufacture and deal in lamps, lighting systems, reflectors, etc.

The Electrical Consumers' Adjustment Corporation of New York, N. Y., has been incorporated by C. Townley, S. Well and M. Cohen, 1133 Broadway, New York, N. Y. The company is capitalized and purposes to do a general electrical and mechanical engineering business.

The Barlow Electric Specialties Company of Yonkers, N. Y., has been chartered with a capital stock of $10,000 to manufacture and deal in metal castings, devices, machinery and auto parts. The incorporators are C. W. Boote, M. E. Blauvelt and W. N. Barlow, 28 North Broadway, Yonkers, N. Y.

Trade Publications

Ventilating Fans.—B. F. Perkins & Son, Inc., Holyoke, Mass., have prepared an illustrated booklet which describes their directly connected electrically operated ventilating fans.

Automatic Water-Level Alarm System.—Louis Stern, 120 North Seventh Street, Philadelphia, Pa., has prepared a leaflet descriptive of an automatic alarm system for water tanks.

Discount List of Hubbell Material.—Harvey Hubbell, Inc., Bridgeport, Conn., has prepared a list which gives discounts on various Hubbell products for the Eastern and Western territory.

Slitting and Rewinding Machines.—The Cameron Machine Company, Brooklyn, N. Y., has prepared an illustrated catalog on its paper-roll-cutting, slitting and rewinding machines.

Pot-Heads.—The G. & W. Electric Specialty Company, 7440 South Chicago Avenue, Chicago, Ill., is sending out an illustrated folder which contains information on its type S pot-heads.

Electric Fans.—Catalog 8-A, which is illustrated, describes the various types of fans placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Automobile Spot Lamps.—The Woods Manufacturing Company, Fairfield, Conn., has prepared an illustrated leaflet which describes its new type of electrically operated automobile spot lamps.

Bakelite.—The General Bakelite Company, 100 William Street, New York, has prepared an interesting booklet printed in colors which contains information on the various uses to which bakelite is put.

Storage Batteries.—"Storage Battery Stand-by Service on an Alternating-Current Distribution Circuit" is the title of Bulletin No. 153, recently issued by the Electric Storage Battery Company, Philadelphia, Pa.

Motors for Clothing Factories.—Bulletin No. 204, issued by Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill., contains information on and illustrations of its motors for use in clothing factories.

Electric Blower.—The Rosewater Electric Company, 3110 Croton Avenue, Cleveland, Ohio, has prepared an illustrated leaflet which describes its small electrically operated blower particularly adapted for use with forges.

Vacuum Cleaner.—The Vacuna Sales Company, 251 Fifth Avenue, New York, has prepared several illustrated bulletins on various types of electrically operated vacuum cleaners and motor-driven floor-finishing machines.

Electrically Operated Coffee-Roasting Machine.—Jabez Burns & Sons, 600 West Forty-third Street, New York, has prepared an illustrated bulletin which contains information on an electric coffee-sample-roasting machine.

Electric Cooking and Heating Stoves.—The Quick Electric Heater Company, Station M, Cincinnati, Ohio, is sending out a leaflet which contains information on its No. 30 electric-heating stove and No. 5 electric-cooking stove.

Oil Engines.—"Economical Power Plants" is the title of an illustrated catalog containing information on various types of oil engines which has recently been issued by the De La Vergne Machine Company, 1189 East 138th Street, New York.

Stokers.—The Laclede-Christy Clay Products Company, Manchester Avenue and Sulphur Avenue, St. Louis, Mo., contains information on its automatic stokers in the plant of the Indianapolis Water Company, two of which represent repeat orders.

Cooling Towers.—"Condensing Plants with Natural-Draft Cooling Towers" is the title of an illustrated folder containing information on various installations of cooling towers manufactured by the Wheeler Condenser & Engineering Company, Carteret, N. J.

Electric Fans.—"Watch the Way the Wind Blows" is the title of a three-colored pamphlet just issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which lists various sales helps that the company is prepared to give to the dealers.

Automobile-Electric-System Trouble-Finding Device.—The American Bureau of Engineering, Inc., 1018 South Wabash Avenue, Chicago, Ill., has prepared an illustrated bulletin entitled "A Story of Ambu the Trouble Shooter," which contains information on an instrument for detecting trouble in electric systems on gasoline-operated automobiles.

Ornamental Lighting Devices.—Bulletin No. 108 prepared by the F. W. Wakefield Brass Company, Vermilion, Ohio, contains information on canopies with hooks, tube and chain supports, loops, cast hooks and buttons, and Bulletin No. 109 shows various types of plain and ornamental brass chains for fixture suspension and several types of brass couplings and terminals.

New England

BINFORD, N. H.—The installation of an electric-light plant is under consideration. H. B. Hanson is reported interested in the project.

MEREDITH, N. H.—The Meredith El. Lt. Co. will install a submarine cable connecting with Beaver Island, Lake Winnepesaukee, with its line on Meredith Neck. The company is developing the farming community and the summer cottage colony in that district. A. H. Palisted, Meredith, is superintendent.

MOULTONBORO, N. H.—The Sandwich & Moultonboro El. Ltg. Co., recently incorporated, is erecting an electric distribution system in Moultonboro. A hydroelectric plant will be built in Moultonboro, which will supply electricity here and in Sandwich, 5 miles distant. The line work is being done under the supervision of A. H. Plaisted & Co., Meredith.

PEABODY, MASS.—The proposal to make extensions to the municipal electric-light plant, involving an expenditure of $40,000, will be submitted to the voters at the next town meeting. The present plans provide for the installation of either two 500-kw. or one 800-kw. turbo-generating unit of the low-pressure type, to operate in connection with two engine-driven generators having a present combined rating of 800 kw. A cooling tower will also be erected if authority is granted for the extension. The town may possibly consider the purchase of energy as an alternative plan.

NEW HAVEN, CONN.—Application has been made to the Public Utilities Commission by the Housatonic Pwr. Co., New Haven, for approval of the erection of a power transmission line from its power house at Bull's Ridge through the towns of New Milford and Sherman to the New York State line.

WALLINGFORD, CONN.—A movement has been started by the Chamber of Commerce for the erection of a municipal factory building for the use of small manufacturing plants. Manufacturers of electrical goods are specially desired.

Middle Atlantic

NEW YORK, N. Y.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 27 for a conduit and wiring system and lighting fixtures at the United States appraisers' stores, New York. For details see proposal columns.

NEW YORK, N. Y.—Bids will be received at the office of the depot quartermaster, Army Building, New York, N. Y., until March 8, under Schedule 788, for furnishing 84 canopies, brushed-brass finish; 42 bracket fixtures, 42 electrolier fixtures, 50 pairs insulators, 7 watt-hour meters, 12 Norbit receptacles, 114 flush switches, two transformers, 6000 ft. copper wire, eight fuse plugs, three entrance switches and 500 ft. copper conductor wire. For further information address Col. A. L. Smith, depot quartermaster.

NIAGARA FALLS, N. Y.—A force of engineers is being organized, it is reported, by Hugh L. Cooper, consulting engineer, 101 Park Avenue, New York, N. Y., and Harry Kornfield, who represents large financial interests in New York, N. Y., for the purpose of making a survey of the lower river with a view of promoting a hydroelectric project. The plan is similar to that of the Lower River Pwr. Co., incorporated some years ago, but never developed.

OSWEGO, N. Y.—The Municipal Water Service Commission has engaged John A. Bensel, Bernardsville, N. J., former State engineer and surveyor, to take charge of the water-power development at Dam No. 6. Work will begin immediately on preliminary plans for the proposed development, which will include the construction of a large power station, etc. John D. Higgins is chairman of commission.

SILVER CREEK, N. Y.—The Silver Creek El. Co. contemplates extending its transmission lines from Silver Creek through Irving, Hanover Center and Smith's Mills to Forestville. The company was recently granted a franchise in Hanover.

INTERCOURSE, PA.—The Intercourse El. Lt., Ht. & Pwr. Co. expects to install in the near future about 24 street lamps. Enos L. Zimmerman is general manager.

JOHNSTOWN, PA.—The Dale Lt., Ht. & Pwr. Co., Johnstown, contemplates enlarging its power plant to enable it to supply electricity in the city of Johnstown. The company now furnishes electrical service in Walnut Grove, Dale Borough, Stony Creek Township and Lorain Borough. Definite plans not yet decided upon. C. F. Lancaster is manager.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

LANSDALE, PA.—The Borough Council is considering doubling the output of the municipal electric-lighting plant.

MAUCH CHUNK, PA.—Extensive improvements are being made to the power plants of the Carbon Transit Co. at Hacklebernie and at East Mauch Chunk. New engines and generators are being installed.

PHILADELPHIA, PA.—The new power plant of the Barren Hill & Wissahickon branch of the Philadelphia Rapid Transit Co. will be erected on the Ridge Pike, just north of the city line.

READING, PA.—The Reading Transit & Lt. Co. has signed a contract with the Counties Gas & El. Co., Norristown, to supply electricity to operate its system, beginning May 1, 1916. The power stations in Collegeville and Shawmont which now furnish power to operate the cars will be closed down.

SAYRE, PA.—The Sayre El. Co. is installing a 200-kw. rotary converter with transformer. F. S. Nicholson is second vice-president and general manager.

BELVIDERE, N. J.—The Warren Wood Working Co., Belvidere, is considering installing a new boiler with a rating of from 300 hp. to 400 hp. F. E. Mercer is superintendent

BUTLER, N. J.—The Borough Council is contemplating establishing a day service in connection with the municipal electric-light plant within a few months. Provisions are being made for a two-phase, 110/220-volt motor circuit. Robert Trent is chief engineer.

HIGHTSTOWN, N. J.—Plans are being considered by the Borough Council for the installation of a municipal electric-light plant in Hightstown.

HOBOKEN, N. J.—The City Commission has awarded the Public Service El. Co. the contract for lighting the streets of the city for a period of five years. The new contract privides for the installation of an ornamental lighting system in the near future.

LONG BRANCH, N. J.—Preparations are being made by the Consol. Gas Co. of New Jersey for the installation of an underground conduit in Long Branch, for which contracts have been placed with G. M. Gest, Woolworth Building, New York, N. Y., and the Safety Insulated Wire & Cable Co., 114 Liberty Street, New York. The company is planning to make a special campaign for pumping business. Fred R. Cutcheon is vice-president and general manager.

PERTH AMBOY, N. J.—The Pub. Ser. El. Co. is planning to install an underground conduit in State and Smith Streets, to cost about $30,000. Application has been made for a permit for the work.

BALTIMORE, MD.—An additional loan of $1,500,000 has been asked by the Board of Estimates for the completion of the municipal system of conduits for electric wires. R. C. Thomas is chief engineer of the electrical commission.

BALTIMORE, MD.—Plans are being prepared by Mahlon H. Dickinson, Philadelphia, Pa., architects, for an indirect lighting system to be installed in the Emersonian Apartments, Baltimore. Bids will be asked, it is understood, about March 15.

FORK UNION, VA.—Plans are being considered for the erection of a complete set of new buildings for the Fork Union Military Academy. It is also proposed to change the lighting system from acetylene gas to electricity. It is estimated that a 15-kw. generator driven by a fuel-oil engine of from 10 hp. to 15 hp. will be required. Complete wiring, emergency batteries, switchboard, etc., for about four buildings will be needed. C. E. Crosland, Fork Union, would like to receive catalogs, price lists, etc., and to correspond with manufacturers of and dealers in electrical equipment.

FRONT ROYAL, VA.—The business men of Front Royal have rejected the proposal of the Northern Virginia Pwr. Co., Winchester, to furnish the town with electricity and have decided to make improvements to the municipal hydroelectric plant and also to erect an auxiliary steam-power plant.

SOUTH BOSTON, VA.—Bids will be received by the Mayor and Board of Aldermen, City Hall, South Boston, until March 30 for municipal improvements, consisting of pumping station and filter plant building, auxiliary pumping station, coagulating basin, filtered-water well, filter equipment, boilers and machinery, piping connections, force mains and reservoir. Anderson & Christie, Inc., Charlotte, N. C., are consulting engineers.

WINCHESTER, VA.—Preparations are being made for the installation of an ornamental street-lighting system, to cost about $6,000. A. Langstaff, consulting engineer, Richmond, will have charge of the work.

WASHINGTON, D. C.—Bids will be received at the office of the purchasing clerk, Bureau of Engraving and Printing, Washington, until March 10 for furnishing four 5-hp., 220-volt, direct-current shunt-wound semi-inclosed motors and one 7½-hp. motor.

WASHINGTON, D. C.—Bids will be received at the office of the purchasing agent, Commissioners of District of Columbia, Washington, D. C., until March 6 for furnishing 15 rheostats, sliding contact, resistance wire-wound on metal tube, for the Western High School.

WASHINGTON, D. C.—Bids will be received by the purchasing agent of the Post Office Department, Washington, D. C., until March 14 for furnishing and delivering from time to time as they may be required and ordered for use in the postal service during the fiscal year ending June 30, 1916, electric automobile trucks as follows: One or more of 1-ton capacity, one or more of 2 tons capacity, and one or more of 3 tons capacity.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Norfolk, Va., Schedule 9347—5500 lb. steel-wire rope, 8960 ft. tubing steel; Schedule 9345—600 steel boiler tubes. Charleston, S. C., Schedule 9353—750 lin. ft. three-conductor cable, miscellaneous duplex cable, 950 lin. ft. paper-insulated, lead-sheathed cable. Brooklyn, N. Y., Schedule 9346—miscellaneous interior-communication cable, miscellaneous single and twin-conductor wire; Schedule 9351—150 signaling searchlights; Schedule 9335—12 blowers. Pensacola, Fla., Schedule 9339—one wire-testing machine. Mare Island Cal., Schedule 9334—two cargo oil pumps. Applications for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Commerce reports as follows: No. 20,228—An American consular officer in India writes that a firm in his district desires to be placed in touch with American manufacturers and exporters of motors, generators, switchboards, incandescent Mazda standard and half-watt lamps, transformers and meters; pumping machinery for water-works and sewage; leaded lamps for churches, temples, public buildings, etc.; Portland cement; electric, hydraulic and hand-power elevators for passengers and freight; refrigerating and cold-storage plant; automatic signaling, interlocking machines, etc.; manual signaling apparatus, etc.; water-level recorders, and all appliances for water gaging; motorboats and accessories; water meters of all kinds; hydraulic machinery, turbine pumps, etc.; stationary oil engines, combined engines and pumps, etc. No. 20,237—An American consular officer in India reports that a government official in that country desires to be placed in touch with American manufacturers of electrical, iron and steel and wood-working machinery; agriculture implements, and hydroelectric machinery for use in educational and agricultural institutions. No. 20,243—An American consular officer in Spain reports that a man in his district desires to purchase at wholesale supplies of small articles for electrical installation. Correspondence should be in Spanish. No. 20,245—An American consular officer in Canada writes that a firm in his district desires to communicate with American manufacturers of copper-clad wire used in making copper nails. It is stated that copper-washed wire is not wanted. No. 20,262—A firm in India writes that it desires to communicate with American manufacturers of bullock power pumps having a capacity of from 3000 gal. to 4000 gal. per hour, for wells 50 ft. deep and 12 ft in diameter, pump and animal-power gear being placed at the top of the well; hand-power pumps having a capacity of not less than 1500 gal. to 2000 gal. per hour for wells 50 ft. deep, and power pumps having a capacity not exceeding 6000 gal. for wells 50 ft. to 60 ft. deep. Further information may be obtained on application to the Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., and its branches.

North Central

MUSKEGON, MICH.—The Muskegon Trac. & Ltg. Co. contemplates extensions and improvements to its system this year, involving an expenditure of about $36,000.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchase and supplies, City Hall, Cleveland, Ohio, until March 10 for substation transformers for the municipal electric-light department. Specifications may be obtained at the office of the commissioner of light and heat, 1443 East Third Street.

CONNEAUT, OHIO.—Preparations are being made for the installation of a 150-kva., 60-cycle, 2300-volt, three-phase alternator and engine, for which bids were opened March 3. Benjamin Laubach is superintendent.

DEFIANCE, OHIO.—The capital stock of the Defiance Gas & El. Co. nas been increased from $300,000 to $850,000.

GROVEPORT, OHIO.—The Public Utilities Commission has granted the Scioto Valley Trac. Co., Columbus, permission to purchase the electrical distribution system of the Groveport Development Co. The Scioto company, it is understood, will install a new distributing system here.

HOLGATE, OHIO.—The Board of Public Works is considering extensions to the municipal electric-light plant and may install a 150-hp. boiler or may change the motive power to oil engines. The purchase of power to operate the municipal system is also under consideration. E. M. Ball is manager.

MASSILLON, OHIO—The Massillon El. & Gas Co. is contemplating the installation of an ornamental incandescent street-lighting system, with some underground wiring, during 1916.

LOUISVILLE, KY.—The Harry I. Wood Co., 514 West Main Street, Louisville, has secured the contract for all conduit and wiring for lighting and power wires, and all conduits for all 2-in. and 3-in. conduit for telephone equipment, for the two-story and basement exchange of the Home Tel. Co., Louisville. Also a contract for wiring the Bonnie Apartments in Louisville, which covers a complete conduit system for lighting and power wires, vestibule telephones, city telephones, bells and annunciators. Also contract for covering the installation of one 35-hp. and two 20-hp., three-phase, 220-volt motors for the Ewald Iron Co. of this city. All of this work is to be installed in conduit. The company also has a contract for the installation of main and branch feeders for two 225-kw., three-phase, 220-volt enameling ovens which are to be installed by the Ford Motor Co. of Louisville.

RUSSELLVILLE, KY.—The South Kentucky Pwr. Co., Pembroke, has submitted a proposal to the City Council offering to take over the municipal electric-light plant and water-works system. The company proposes to pay the city $15,000 and asks for a 20-year franchise, agreeing to install an ornamental lighting system in the public square, etc. As yet no action has been taken on the proposal by the city.

AKRON, IND.—Arrangements are being made by the Akron Lt., Ht. & Pwr. Co. for the installation of a motor and pump (250 gal. per minute capacity) for the water-works system.

RICHMOND, IND.—The Liberty Lt. & Pwr. Co., Richmond, has increased its capital stock from $25,000 to $65,000.

ROCKVILLE, IND.—The Rockville Lt. & Pwr. Co. is contemplating the installation of a coal conveyor. The company has just completed the installation of an ornamental lighting system around the public square. F. R. Calvert is superintendent.

ALBION, ILL.—The Albion El. Lt. & Gas Co. expects to install two new boilers of about 150 hp. each, a new engine and a generator with a rating of about 150 kw. some time this spring. L. Richards is superintendent and chief engineer.

BELLEVILLE, ILL.—Plans are being considered by the board of local improvements for the installation of an ornamental lighting system around the public square, to cost about $8,100.

BERWYN, ILL.—Bids will be received by the City Council, City Hall, Berwyn, until March 21 for the installation of an ornamental street-lighting system and a general street-lighting system, to cost about $15,000. For details see proposal columns.

CHICAGO, ILL.—Bids will be received by J. F. Neil, secretary of South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, Chicago, until March 15 for furnishing cast-iron electric lamp posts and other cast-iron electric fixtures for use in Grant Park.

KANKAKEE, ILL.—Bids will be received by C. B. Sawyer, chairman of the building committee, Kankakee, until March 25 for the construction of a lodge and club house for the Order of Elks at Kankakee. Separate bids to be submitted for heating, plumbing and electrical work.

NORMAL, ILL.—Bids will be received at the office of the president of the State Normal University at Normal until March 21 for construction of Women's Dormitory on the grounds of the Illinois State Normal University at Normal. Separate bids will be received on plumbing, heating, electrical wiring and elevator. Copies of plans and specifications may be obtained from J. B. Dibelka, State architect, 130 North Fifth Avenue, Chicago, Ill.

PALOMA, ILL.—The Paloma El. Lt. Co., recently organized, has awarded a contract for the installation of an electric-light plant. The plant will be driven by a gasoline engine. Electricity will be furnished for both residential and street lighting. H. G. Henry is president.

ROCK ISLAND, ILL.—Bids will be received at the office of the commanding officer, Rock Island Arsenal, Rock Island, until March 9 for furnishing, under proposal 654, 5000 wire cutters according to specification given on print 20-2-124, last revised April 23, 1915; also 1000 soft-rubber tips, first quality.

STREATOR, ILL.—The contract for the installation of the ornamental street-lighting system has been awarded to J. W. Gates, Inc., Streator. The plans provide for the erection of 107 King's No. 711 ornamental standards with Novalux tops and five King's posts No. 11, with round globes for safety islands; 64 lamps of 600 cp., 43 lamps of 250 cp. and five lamps of 60 cp, maintained by underground wires. The cost of the system is estimated at $10,500. H. G. Young is city electrician.

BALATON, MINN.—The Village Council has granted the Citizens' Lt., Ht. & Pwr. Co., Tracy, a franchise to install and operate an electric-light system in Balaton for a period of 25 years.

BRAINERD, MINN.—The Cuyana Range Pwr. Co., Deerwood, is contemplating the construction of another dam at Pillager, to develop 2000 hp. The company, it is reported, is considering the erection of a transmission line to Motley and building a 1000-kw. steam-driven power plant near Ironton.

MILAN, MINN.—The Milan Lt. & Pwr. Co. is contemplating the installation of an additional 25-hp. generating unit.

MINNEAPOLIS, MINN.—Bids will be received by the board of education, Minneapolis, until March 10 for general work, heating, ventilating, plumbing and electric work for the addition to the Horace Mann School. Plans and specifications may be seen at the office of Stebbins & Haxby, architects, 450 Auditorium Building, and Rose & Harris, engineers, 470 Auditorium Building, Minneapolis. Copies of plans may be obtained upon deposit of $20.

ST. PAUL, MINN.—Local improvements involving an expenditure of $300,000 are contemplated by the Northern Pacific Ry. Co. A power house, costing about $100,000; an ice house and foreman's buildings, all of steel and concrete, will be erected on land acquired by the company near the Third Street viaduct and the Northern Pacific tracks.

ALBIA, IOWA.—The property of the Southern Iowa Ry. & Lt. Co., Albia, was purchased at auction on Jan. 21 by Guy. J. Walker, New York, N. Y., at $75,000. The company supplies electrical service in Albia and surrounding villages and operates two interurban railways.

ROCK RAPIDS, IOWA.—Improvements are contemplated to the municipal electric-lighting plant, including the installation of an engine, boiler, direct-current generator and switchboard. W. F. Gingrich is superintendent.

SHENANDOAH, IOWA.—The erection of a transmission line to Imogene (10 miles distant) is contemplated by the Artificial Ice, Pwr., Ht. & Lt. Co., Shenandoah.

TIFFIN, IOWA.—The citizens have voted to install an electric distributing system in Tiffin and will secure energy from the Iowa Ltg. & Pwr. Co., Cedar Rapids.

BRANSON, MO.—The city of Branson has granted a franchise to W. E. Meyers and H. A. Larson to install and operate an electric-lighting system in Branson for a period of twenty years.

LUCERNE, MO.—The Lucerne El. Lt. Co., recently incorporated, is contemplating the installation of an electric plant to supply electricity for commercial purposes. S. L. Prough and W. M. Boland are among the incorporators.

ST. LOUIS, MO.—The Cupplies Station Lt., Heat & Pwr. Co., St. Louis, has applied to the Board of Public Service for a permit to erect transmission lines on Newstead Avenue from Forest Park to Easton Avenue. The company proposes to enter the West End residence district to supply electricity for lighting purposes.

ENDERLIN, N. D.—The General Utilities Corpn., Enderlin, is contemplating the installation of a new generating unit, consisting of a 150-kva. generator directly connected to a Hamilton Corliss engine, 16 in. by 36 in., and the erection of a transmission line to Sheldon, a distance of 7 miles. F. A. Barnard is manager.

HUNTER, N. D.—The Hunter Lt. & Pwr. Co. is contemplating the installation of a new 30-hp. to 40-hp. oil engine, generator and switchboard in the near future. Also a new automobile garage in connection with its power plant. F. C. Hockridge is vice-president.

JAMESTOWN, N. D.—The Western El. Co., Jamestown, is contemplating the construction of a new power plant, the equipment to include two water-tube boilers equipped with economizers and stokers.

MINOT, N. D.—Bids will be received by the St. Joseph Hospital Association of St. Paul, Minneapolis, Grand Forks, Minot, N. D., until March 15 for the construction of a hospital to be erected at Minot. Separate bids will be received for electric wiring, heating and plumbing. J. C. Woodruff, Minot, is architect.

ASHTON, S. D.—Arrangements have been made by the Spink County Pwr. Co., Ashton, for the installation of a 250-hp. Diesel engine which will probably be installed this fall. The company now supplies electrical service in the towns of Ashton and Melette. Connection will be made with the towns of Northville, Athol, Brentford and Frankfort in the spring. Hugh Triplett, Redfield, is consulting engineer.

BRIDGEWATER, S. D.—The Bridgewater El. Pwr. Co. is planning to enlarge its power house and to install one 120-hp. Delavergne oil engine, one 75-kva. Westinghouse generator (directly connected), and to extend transmission line to Emery, a distance of 10 miles.

LESTERVILLE, S. D.—Plans are being considered for the installation of a municipal electric-lighting plant in Lesterville.

BLUE SPRINGS, NEB.—A franchise has been granted to the Nebraska Gas & El. Co., Norfolk, to supply electricity in Blue Springs for a period of 25 years.

CORDOVA, NEB.—Bids will be received by L. B. Lull, village clerk, Cordova, until March 9 for the installation of an electric-lighting system in Cordova.

STUART, NEB.—Bids will be received by the School Board District No. 44, Holt County, Stuart, until March 21 for construction of high-school building. Separate bids will be received at the same time for plumbing, heating and ventilation, and electric wiring. R. A. Bradley & Co., Exchange National Bank Building, Hastings, are architects.

CONCORDIA, KAN.—The Concordia El. Lt. Co. is contemplating extending its transmission lines to several additional towns. L. K. Green is manager.

DANVILLE, KAN.—Plans are being considered by the citizens of Danville and the farmers between Danville and Harper to secure electrical service from the municipal plant in Harper.

FORT SCOTT, KAN.—Estimates will be received by the L. A. Wells Construction Co., 34 Wade Building, Cleveland, Ohio, on grading 250,000 cu. yd. for construction of an electric railway from Fort Scott to Mulberry. The company is also in the market for steel rails and connections, ties, poles, high-tension wires, etc.

FRANKFORT, KAN.—The Frankfort Lt. & Power Co. is planning to erect a 6600-volt transmission line to Winifred and Vleits in the near future. F. C. Dwinnell is owner.

FREDONIA, KAN.—The Fredonia Ice & Lt. Co. has recently installed a 187-kva. Westinghouse steam-turbine generator and has placed contracts for installation of a 200-hp. boiler and the erection of a concrete chimney, 100 ft. by 4 ft. 6 in.

GARDEN CITY, KAN.—An ordinance is being prepared by the City Council calling for an election to submit the proposal to issue bonds for the purchase of the Marsh telephone and lighting plant.

GENESEO, KAN.—The town of Geneseo will erect 6000 ft. of transmission line in connection with the municipal electric-light plant as soon as the weather will permit. Chester Norman is manager.

GIRARD, KAN.—Two new marine boilers having a rating of 250 hp. each have recently been installed in the municipal electric-light plant. E. B. Parker is superintendent.

HUTCHINSON, KAN.—Extensive improvements are under way at the plant of the United Wtr., Gas & El Co., Hutchinson,

including the installation of one 5000-kva. Curtis steam turbine, one 300-kw., 500-volt rotary converter, new switchboard panels and instruments, one 5000-sq. ft. Le Blanc surface condenser, one 600-hp. Stirling boiler, the erection of one 175-ft. concrete stack and additions to boiler and turbine rooms. The company also contemplates the installation of ornamental street lamps on 12 additional blocks. J. F. Springfield is general manager.

LINDSBORG, KAN.—Larger boilers are needed for the municipal electric-light and water plant. As yet nothing definite has been decided upon.

LYNDON, KAN.—The town of Lyndon is contemplating the purchase of a Diesel oil engine. Roy W. Wright is superintendent.

MORLAND, KAN.—At an election held recently the proposal to issue $8,000 in bonds for the installation of a municipal electric-light plant was carried.

OLATHE, KAN.—At a special election held recently the proposal to issue $50,000 in bonds for the purchase of the Olathe El. Lt. & Pwr. Co. to be owned and operated by the municipality was carried.

OSBORNE, KAN.—The Council is contemplating calling an election to vote on a $7,000 bond issue to provide funds for additions to the municipal electric-light plant.

PLAINVILLE, KAN.—The Plainville Mill & El. Co. is contemplating the installation of an oil engine in the near future.

Southern States

BADIN, N. C.—The Tallassee Pwr. Co., recently organized to take over the Yadkin Narrows development for the Aluminum Co. of America, which purchased the properties of the Southern Aluminum Co., has revised plans for the Yadkin River development, which include construction of spillway to replace two wells in dam, the installation of three 18,000-kw., 13,000-volt, 36-cycle generators; transmitting electricity to Yadki Narrows (new name of Badin development), and construction of power house; also an eight-pot development for aluminum plant. Arthur V. Davis, Bryson City, N. C., and Oliver Building, Pittsburgh, Pa., is general manager.

HICKORY, N. C.—The Community Club, Startown Farm Life School District, is contemplating the installation of a small electric-light plant.

LUMBERTON, N. C.—Extensive improvements are under way by the Water and Light Department, including the erection of 6 miles of transmission lines, the installation of 13 transformers, one 200-kva. generator, 300 watt-hour meters, one water filter, 100 water meters and four centrifugal pumps. George L. McNeill is superintendent of water and light department.

TROY, N. C.—The Smithtown Pwr. Co., recently incorporated with a capital stock of $300,000, is contemplating a hydroelectric development on Little River, about 7 miles northeast of Mount Gilead. J. C. Hurley is interested.

WILSON, N. C.—Bids will be received by the Mayor and Board of Town Commissioners until March 27 for water-works improvements, consisting of an extension to the present electric power station, forming a pump room and filter building, construction of a concrete coagulating basin, a 1,000,000-gal. reservoir, auxiliary raw-water pumping station and intake, a 14-in. raw-water force main, 4 miles long; also furnishing and erecting a cross-compound pumping engine of 21000 gal. per minute capacity and installation of necessary piping and plant equipment. Anderson & Christie, Inc., Charlotte, N. C., are consulting engineers.

BENNETTSVILLE, S. C.—Plans are being considered for the erection of a new steel stack for boilers (75 ft. high, 40 in. in diameter, flared at bottom to 46 in.) at the municipal electric-light plant. Some motor pumps may be installed during the year and possibly a new engine, either steam or oil. E. C. Morrison is manager.

FLORENCE, S. C.—Within the next two months the Carolina Central El. Co., Florence, expects to erect 12 miles of 13.000-volt transmission line. Transformers (General Electric) have been purchased. F. G. Godfroy is general superintendent.

FORT MILL, S. C.—The Council is considering the installation of an electric-lighting system.

WINNSBORO, S. C.—Within the next 30 days the Board of Public Works expects to begin operating the new electric-lighting plant. Energy will be obtained from the Parr Shoals Pwr. Co., which will be delivered at 23.000 volts and distributed at 2300 volts. The substation is equipped with three 75-kva. transformers. A 24-hour service will be established. T. R. Ellison is superintendent.

ACWORTH, GA.—Bonds to the amount of $5,000 have been voted for the extensions to the municipal electric-light plant and water-works systems.

JUNCTION CITY, GA.—The installation of a municipal electric-light plant in Junction City is reported to be under consideration.

PLANT CITY, FLA.—The City Council is considering the installation of a municipal electric-light plant, to cost about $50,000, and extensions to the municipal water-works system, involving an expenditure of about $71,000. Preliminary estimates have been prepared by the Jaudon Engineering Co., Savannah, Ga.

CHATTANOOGA, TENN.—Local capitalists, it is reported, will build an open-hearth steel plant and rolling mill in Chattanooga, to cost about $2,000,000. Electrical energy generated at a hydroelectric power plant on the Tennessee River will be used.

BIRMINGHAM, ALA.—Surveys are being made by the Alabama Pwr. Co., Birmingham, for the extension of its transmission line to Jasper.

LUCEDALE, MISS.—Plans are being considered for the installation of a municipal electric-lighting plant in Lucedale.

VILLE PLATTE, LA.—The city of Ville Platte is considering an issue of bonds, the proceeds to be used for the construction of an electric-light plant and water-works system.

CHANDLER, OKLA.—The Chandler El. Co. is contemplating increasing the output of its plant by 200 hp.

GOTEBO, OKLA.—The Gotebo Lt. & Pwr. Co. is planning to install one 25-kw. to 50-kw. direct-current, two or three-wire, 220-volt generator, 325 r.p.m., and one 15-kw. to 20-kw., 220-volt generator, 270 to 280 r.p.m. Would use second-hand machines if in first-class order. The generators are to be connected directly to oil engines. J. A. Litel is manager.

HENNESSEY, OKLA.—Negotiations are now under way looking to the purchase of the property of the Hennessey El. Pwr. & Ice Co. by F. H. Tathwell, lessee of the property for the past three years. Reorganization plans, as at present contemplated, provide for an additional generating unit and an ice-making machine, with the possibility of establishing a 24-hour service. The consummation of the deal hangs on the granting of a new franchise.

STRATFORD, OKLA.—Bonds to the amount of $35,000 for the installation of a municipal electric-light plant and water-works system have been voted.

ARCHER CITY, TEX.—The City Council is considering the installation of a municipal electric-light and power plant.

BATSON, TEX.—The electric-light plant and machine shop owned by Thompson & Beitrich, which was recently destroyed by fire, will be rebuilt. The cost of the new plant is estimated at about $50,000.

DE KALB, TEX.—Plans are being considered for the installation of an electric-light plant in De Kalb. M. Risinger, Nashville, Ark., is reported interested.

GILMER, TEX.—The Texas Pub. Ser. Co. is contemplating the installation of a 75-kva., three-phase, 60-cycle, 2300-volt generator, directly connected to a high-speed steam engine (non-condensing type). Neville Levy is local manager.

NIXON, TEX.—The City Council has granted a franchise to J. F. Wood, Jr., to construct and operate an electric-light plant in Nixon.

SAN ANGELO, TEX.—Plans are being prepared by the San Angelo Wtr., Lt. & Pwr. Co. for the construction of a large central electric-power station in San Angelo. A system of electric transmission lines will be erected to towns in this section and also to farmers in this district to supply electricity to operate pumping plants.

Pacific States

EVERETT, WASH.—Notice has been filed by J. L. Fountain, 5016 Twelfth Avenue, Northeast, Seattle, with the Snohomish County Commissioners, Everett, appropriating 10,000 cu. ft. per second of water on the Sauk River for hydroelectric development.

OPPORTUNITY, WASH.—The Modern El. Wtr. Co., Opportunity, it is reported, contemplates the installation of electric meters in all buildings in the city. Several hundred will be required. A. B. Houk is superintendent of the company.

BAKER, ORE.—The City Commissioners have instructed the city engineering department to prepare plans for the installation of cluster lamps in the business district. Electricity for maintaining the lamps will be supplied by the municipal plant.

ALBION, IDAHO.—Arrangements, it is reported, have been made between the city of Albion and the United States government which provide for the erection of an electric transmission line from the pumping plant of the Minidoka tract to Albion and a distribution system in Albion.

BURKE, IDAHO.—The Canyon Creek El. Lt. Co., Burke, expects to purchase some meters, to cost about $1,000.

PAUL, IDAHO.—The Paul El. Co. has applied to the Public Utilities Commission for permission to establish a small electric light and power plant in Paul.

CASCADE, MONT.—The Great Falls Pwr. Co., Great Falls, has been awarded the contract for lighting the streets of the city. The contract calls for the installation of 30 nitrogen-filled lamps of 250 cp.

TERRY, MONT.—The City Council has awarded the Terry El. Lt. & Pwr. Co., recently organized, a contract for street lighting covering both the business and residence sections.

Canada

NEW CASTLE, N. B.—Preparations are being made to install a motor-driven centrifugal pump (450 gal. per minute capacity) in the municipal electric plant at once. As soon as practical a 24-hour service will be established. J. E. Lindon is town clerk.

CLINTON, ONT.—The Clinton Public Utilities Commission has closed an agreement with the Clinton Knitting Co. to furnish the company with electricity for lamps and motors. The municipality has taken property of the Clinton El. Lt. Co. and has discarded the steam generating plant, purchasing energy from the Hydro-Electric Power Commission of Ontario. H. B. Chant is superintendent.

DASHWOOD, ONT.—The by-law authorizing the installation of a hydroelectric power has been approved by the ratepayers. A transmission line, it is understood, will be erected from Exeter west to Dashwood, with branches from Sarepta north to Zurich and south of Crediton.

LINDSAY, ONT.—The Lt., Ht. & Pwr. Co, Lindsay, will require 100 meters from 10 amp. to 50 amp. for distributing system and 50 kw. in transformers. W. E. Reesor is local manager.

LONDON, ONT.—The Public Utilities Commission is contemplating changing the ornamental street-lighting system, removing the five-lamp clusters and substituting an extension with goose-neck mantel with a single lamp. A 225-hp. horizontal twin-turbine waterwheel has been installed in place of two old vertical machines in the Springbank substation; also a 250-hp. motor and a 3,000,000-gal. turbine pump, to be driven by belt from waterwheel, not yet in operation. A bank of three 200-kw. self-cooled transformers will be placed in the new London & Port Stanley car barns when completed. This building will be known as substation No. 6. E. V. Buchanan is general manager.

QUEBEC, QUE.—The Laurentian Pwr. Co., Quebec, has secured a contract from the Quebec Ry., Lt., Ht. & Pwr. Co. for a supply of power. The contract, it is understood, calls for 20,000 hp.

WEYBURN, SASK.—The City Council has applied for authority to appropriate $35,000 for an additional generating unit for the municipal electric plant.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until March 10, under proposal 2060, for furnishing chain hand-rail and coping nosings for Dry Dock No. 1, brass handrails and fittings, ammeter, millivoltmeter, portable testing set, volt-ammeter and red lead. For further information address Major F. C. Boggs, general purchasing officer.

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until March 17, for electric cable, electric switches, transformers, malleable-iron castings, steel castings, well tubing, pipe fittings, etc. Blanks and general information relating to this circular (No. 1019) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kneisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Semi-annual meeting, Washington, D. C., April 27-29.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Section and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark. Convention, May 9-11.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. O. Oschman, Oliver Iron & Steel Co., Pittsburgh, Pa. Annual convention, Chicago, Sept. 18-22.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, James Redpath, 505 Rialto Building, San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, C. A. Littlefield, 130 East 15th St., New York.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, J. E. Kearns, General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., New York. Sections in the principal electrical centers throughout the country. Annual convention, Cleveland, Oct. 18, 19 and 20.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Wier, Athens, Ga.

ILLINOIS ELECTRIC ASSOCIATION. Secretary, H. E. Chubbock, Peoria, Ill.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. L. Blumenthal, 179 West Washington St., Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, C. A. Littlefield, 15th St. and Irving Place, New York. Annual convention, Philadelphia, September.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman. Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 71 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary, W. H. Thomson, Jr., Des Moines, Iowa. Annual meeting, Dubuque, Iowa, May 10-12.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

JOVIAN ORDER. Jupiter (president), Thomas A. Wynne, Indianapolis, Ind.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Temporary secretary, E. A. Wright, Manhattan, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St., New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN SECTION, N. E. L. A. Secretary. Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N., Minneapolis, Minn.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, R. H. Smith, Jackson, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York. Annual convention, Chicago, May 22-27.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Annual meeting, New York, July 18-22.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Question-box convention, March 8 and 9.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, E. H. LaTourneau, 602 Electric Building, Portland, Ore. Annual convention, Seattle, Wash., September.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Cedar Point, July 18-21.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus. Annual meeting, Cleveland, June 15 and 16.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Müller, 435 Sixth Ave., Pittsburgh, Pa. Annual convention, Eagles Mere, Sept. 5-8.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Chas. W. Graham, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

UNITED STATES INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, W. S. Vivian, 19 South LaSalle St., Chicago, Ill.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Blvd., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis. Annual meeting, Milwaukee, March 16 and 17.

1,172,277. SANITARY MOUTHPIECE PROTECTOR FOR TELEPHONES; E. R. Gorman, West Haven, Conn. App. filed Jan. 5, 1915. Attachment plate with bendable lugs.

1,172,282. PROTECTOR FOR FUSIBLE CONDUCTORS; W. Handley and O. M. Nickerson, Madison, Maine. App. filed Aug. 6, 1914. Cover with interior clips for cartridge fuse.

1,172,294. RELAY; C. L. Krum, Chicago, Ill. App. filed June 1, 1908. Polarized type for telegraphic receiver.

1,172,301. ELECTRICAL WELDING; T. E. Murray and H. R. Woodrow, New York, N. Y. App. filed Dec. 10, 1915. Roller electrode for lap welding.

1,172,302. ELECTRICAL WELDING; T. E. Murray, New York, N. Y. App. filed Dec. 10, 1915. Roller electrode on a movable shaft.

1,172,322. PROTECTIVE DEVICE FOR ELECTRIC-CABLE JOINTS; P. Torchio, New York, N. Y. App. filed March 13, 1915. Insulating fluid and envelope.

1,172,354. PORTABLE LAMP; W. E. Grote, New York, N. Y. App. filed April 20, 1915. For piano rack, etc.

1,172,364. COMBINATION LIGHTING AND IGNITION SWITCH; W. Kaisling, Chicago, Ill. App. filed Feb. 3, 1913. For automobile work; single locking device.

1,172,365. AUTOMATIC TELEPHONE EXCHANGE; A. Katz, Charlottenburg, Germany. App. filed Jan. 28, 1913. Selecting and testing devices for trunk lines.

1,172,366. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; O. Kirby, Chicago, Ill. App. filed June 19, 1909. Make-and-break devices.

1,172,371. SWITCHBOARD; H. F. Krantz, New York, N. Y. App. filed Sept. 27, 1911. Mechanical and insulating features of panelboard construction.

1,172,384. TIMER AND DISTRIBUTER; D. E. Moulter, Pierre, S. D. App. filed April 3, 1915. For a four-cylinder, four-cycle engine of Ford type.

1,172,395. ELECTRICAL SIGNAL FOR AUTOMOBILES; R. B. Rudy, Niagara Falls, N. Y. App. filed March 3, 1915. Tail-light with indicating arm.

1,172,402. TELEPHONE TRUNKING SYSTEM; C. E. Stephenson, Sioux City, Iowa. App. filed Feb. 14, 1912. The selector bank contacts are provided with guarding potentials as soon as the trunk is seized at either end.

1,172,408. IGNITION DEVICE; L. M. Thoreson, Twin Valley, Minn. App. filed April 10, 1914. Adjustable timing regulator.

1,172,470. HIGH-TENSION SWITCH; C. E. Lininger, Chicago Ill. App. filed May 14. 1915. Revolvable action to clear the terminal of ice or water.

1,172,515. SYSTEM OF DISTANT SELECTION AND CONTROL BY MEANS OF ELECTROMAGNETIC WAVES; L. B. and R. A. Clark, Mutual, Okla. App. filed Jan. 24, 1910. Automatic selector, particularly for dirigible balloons, torpedoes, etc.

1,172,517. STATOR FOR ALTERNATING-ELECTRIC-CURRENT MACHINES; J. L. La Cour, Pesteras, Sweden. App. filed April 9, 1914. One bar in each slot of the core.

1,172,526. SELECTIVE SIGNALING SYSTEM; J. B. Harlow, New York, N. Y. App. filed April 20, 1915. Train dispatcher's semaphore.

1,172,539. ELECTRICALLY CONTROLLED METER SYSTEM; J. W. Lattig, Glenside, Pa., and C. L. Goodrum, New York, N. Y. App. filed Aug. 29, 1904. Automatic-telephone coin collector.

1,172,541. TANK SOUNDER; P. F. McDonnell, J. Brunner and T. Thompson, Cleveland, Ohio. App. filed March 24, 1914. For water-ballasted ships.

1,172,565. WIRE-WINDING DEVICE; C. Ryden, Cranston, R. I. App. filed March 23, 1915. For forming coils with tapered ends.

1,172,568. METHODS OF AND APPARATUS FOR SECURING CONSTANCY IN THE LIGHT OF VACUUM TUBES; F. Schroter, Berlin-Wilmersdorf, Germany. App. filed April 3, 1913. A subsidiary discharge atomizes an impurity-counteracting material.

1,172,583. STARTER AND LIGHT CONTROL FOR MOTORS; W. H. Collier, Nashville, Tenn. App. filed June 9, 1913. Operated from the steering wheel.

1,172,585. SELECTOR SWITCH; H. F. Dobbin, New York, N. Y. App. filed Aug. 23, 1915. For telephone exchange; automatic.

1,172,586. STORAGE BATTERY; J. W. East, Teague, Tex. App. filed Sept. 3, 1915. Tubular grids.

1,172,604. SNAP CLAMP OR GRIP FOR ELECTRICAL CONDUCTORS; T. F. Johnson, Jr., Atlanta, Ga. App. filed Feb. 18, 1914. Spring-pressed jaws with V-recesses.

Record of Electrical Patents

Notes on United States Patents issued Feb. 22, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,172,614. TELEPHONE LOCK; J. E. Lavalley, Portland, Ore. App. filed May 18, 1915. Blocks the receiver arm.

1,172,630. ROTARY CONVERTER; O. H. and A. F. Pieper, Rochester, N. Y. App. filed July 9, 1913. Speed-controlled switch.

1,172,635. LOCK FOR SOCKET SHELLS; R. A. Schoenberg, New York. N. Y. App. filed Dec. 26, 1914. Bayonet-lock type.

1,172,650. WATER-LEVEL-INDICATING SYSTEM AND APPARATUS; A. B. Walton, Lorain, Ohio. App. filed Dec. 18, 1909. For water-ballast tanks for steamships, etc.

1,172,658. ATTACHMENT FOR TELEPHONE DESK SETS; Le Roy D. Allen, Chicago, Ill. App. filed Dec. 20, 1913. Latch for the receiver hook.

1,172,694. MULTIPLE CONNECTOR; A. L. Flint, East Weymouth, Mass. App. filed Jan. 15, 1914. For electromagnetically actuated musical instruments.

1,172,698. IGNITION APPARATUS FOR COMBUSTION ENGINES; V. A. Flynn and B. Dick, St. Louis, Mo. App. filed Jan. 5, 1914. For single or vibrator sparks.

1,172,699. TUBE AND PROCESS AND APPARATUS FOR MANUFACTURING SAME; J. F. Gail and O. Rudd, Kenosha, Wis. App. filed May 1, 1915. Welded lock seam.

1,172,700. PROCESS AND APPARATUS FOR MAKING METAL TUBES; J. F. Gail and O. Rudd, Kenosha, Wis. App. filed May 1, 1915. Thin wall, externally seamless tube.

1,172,704. SOCKET FOR INCANDESCENT ELECTRIC LAMPS; G. A. Harter, Chicago, Ill. App. filed May 13, 1912. Securing the sockets in place.

1,172,705. MOTOR CONTROLLER; C. T. Henderson, Milwaukee, Wis. App. filed Sept. 29, 1909. Slip-ring type for dynamic braking.

1,172,706. AUTOMATIC MEANS FOR CORRECTING THE REGISTRATION OF METERS; F. W. Hild, Portland, Ore. App. filed Feb. 3, 1912. Spring-controlled band.

1,172,713. SIGNALING HORN; M. R. Hutchinson, Orange, N. J. App. filed May 15, 1912. Regulatable tone or sound.

1,172,760. SYSTEM OF CALL DISTRIBUTION; H. M. Bascom, Brooklyn. N. Y. App. filed May 18, 1915. For automatic telephone selection.

1,172,771. IGNITION SYSTEM; B. Dick and A. Flynn, St. Louis, Mo. App. filed April 13, 1914. For single spark or vibrator; automatically controllable.

1,172,821. METHOD OF RUNNING AND APPARATUS FOR PROTECTING ELECTRICAL MACHINES; G. Meyer, Berlin, and A. Kuehns, Schöneberg, Germany. App. filed Jan. 24, 1910. Especially for operating rolling trains.

1,172,826. PANELBOARD CABINET; R. H. Olley, Syracuse, N. Y. App. filed May 6, 1910. Adjustable box and gutter wall.

1,172,852. ELECTRIC FIRE ALARM; J. L. Weathers, Shelby, N. C. App. filed Feb. 5, 1915. Automatic circuit-closer with fusible link.

1,172,880. THERMOSTAT; W. L. Denio, Rochester, N. Y. App. filed April 17, 1912. Adjustable closed-circuit type.

1,172,886. PRESSURE REGULATOR; G. Halter, New York, N. Y. App. filed Oct. 20, 1914. For oxy-hydrogen generators.

1,172,887. ELECTROLYTIC PLANT; G. Halter, New York, N. Y. App. filed Oct. 20, 1914. For generating oxygen and hydrogen.

1,172,890. STORAGE-BATTERY INDICATOR; K. Knudsen, Grand Rapids, Mich. App. filed July 31, 1914. Gas-bubble display.

1,172,910. MANDREL FOR WINDING COILS; A. D. Scott, Jersey City, N. J. App. filed Sept. 27, 1910. Collapsible, with corrugated-strand guiding face.

1,172,917. BRAKE; T. W. Thomas, Ashtabula, Ohio. App. filed Oct. 30, 1914. Electromagnetically controlled disk brake with compensating adjustment.

1,172,923. FRICTION-CLUTCH MECHANISM; B. C. Ball and L. E. Younnie, Portland, Ore. App. filed Oct. 21, 1914. For logging and hoisting drums.

1,172,928. ELECTRIC SWITCH; T. A. C. Both, New York, N. Y. App. filed July 9, 1910. Double push-button and oscillating contacts.

1,172,929. ELECTRIC SWITCH; T. A. C. Both, Fairhaven, Mass. App. filed Aug. 14, 1914. Shallow case and short buttons.

1,172,944. DYNAMO-ELECTRIC MACHINE; E. F. Collins, Schenectady, N. Y. App. filed March 16, 1914. Two-pole machine with constant voltage.

1,172,953. ADAPTER; J. T. H. Dempster, Schenectady, N. Y. App. filed June 5, 1915. Socket-type transformer.

1,172,961. PROTECTIVE DEVICE; S. Dushman, Schenectady, N. Y. App. filed May 20, 1915. For incandescent cathode devices, etc.

1,172,962. ELECTROMAGNETIC SWITCH; J. Eaton, Schenectady, N. Y. App. filed Nov 26, 1912. Remote control.

1,172,963. INSULATOR; A. J. Englehardt, New Orleans, La. App. filed July 12, 1915. Standard pin type with wire clamp.

1,172,968. SYNCHRONOUS DYNAMO-ELECTRIC MACHINE; L. Fleischmann, Berlin, Germany. App. filed June 5, 1914. Alternating-current starter.

1,172,972. PROTECTIVE DEVICE; J. J. Frank, Pittsfield, Mass. App. filed June 6, 1913. For transformers.

1,172,979. APPARATUS FOR ADJUSTING THE DIRECTION OF GUNS; R. Girardelli, Rome, Italy. App. filed Jan. 9, 1914. The training of one gun automatically directs a second gun.

1,172,980. ELECTRIC-LAMP SOCKET; G. W. Goodridge and G. B. Thomas, Bridgeport, Conn. App. filed May 8, 1915. Combined casing and shade holder with pull-switch mechanism.

1,172,990. PROTECTIVE DEVICE; L. A. Hawkins, Schenectady, N. Y. App. filed July 7, 1914. For hot-cathode rectifiers.

1,173,004. ELECTRICAL APPARATUS; W. Kuckling, Reinickendorf-Ost, Germany. App. filed May 22, 1915. Ventilation of disk coil, windings and transformers.

1,173,005. ELECTRODE; C. R. Krueger, Schenectady, N. Y. App. filed April 3, 1915. Magnetite, titanium oxide, titanium carbide, chromide and a flux.

1,173,006. CONTROL-LOCKING MECHANISM; O. Lecy and W. F. Foote, Port Edwards, Wis. App. filed April 14, 1915. For controllers of machine units.

1,173,040. SWITCH MOUNTING AND THE LIKE; H. R. Sargent, Schenectady, N. Y. App. filed May 6, 1913. Adjustable mounting for outlet box.

1,173,052. IGNITION MEANS FOR GAS-BURNERS; C. E. Smith, Vernon, British Columbia, Canada. App. filed April 30, 1914. For automobiles, etc.

1,173,058. REMOTE CONTROL OF DYNAMO-ELECTRIC MACHINES; H. R. Summerhayes, Schenectady, N. Y. App. filed April 29, 1914. Synchronous converter.

1,173,065. VIBRATOR; G. Vande, Los Angeles, Cal. App. filed March 25, 1914. Special mounting for steel spring.

1,173,072. AUTOMATIC FIRE-ALARM SYSTEM; W. Z. Wilkinson, Baton Rouge, La. App. filed July 1, 1915. Local and remote signal.

1,173,079. SELECTIVE TUNING SYSTEM; E. F. W Alexanderson, Schenectady, N. Y. App. filed Oct. 29, 1913. For preventing interference in radiotelegraphy.

1,173,089. DYNAMO-ELECTRIC MACHINE; S. R. Bergman, Lynn, Mass. App. filed June 9, 1909. Field magnet for direct-current machine with distributed exciting winding.

1,173,090. DYNAMO-ELECTRIC MACHINE; S. R. Bergman, Lynn, Mass. App. filed Aug. 21 1914. Compensated direct-current machine.

1,173,094. TERTIARY WINDING; L. F. Blume. Pittsfield. Mass. App. filed July 11. 1913. For polyphase transformer.

1,173,095. PARTY-LINE KEY; A. J. Carter. Chicago, Ill. App. filed April 8, 1914. Reciprocating and rocking two-way keys.

1,173,096. LIGHTNING ARRESTER; F. S. Chapman, Toledo, Ohio. App. filed May 20, 1910. Electrodes in a vacuum.

1,173,099. TEST CONNECTOR; John Davis, Bloomington, Ill. App. filed Jan. 16, 1915. Clamp for telephone circuits, etc.

1,173,153. DYNAMO-ELECTRIC MACHINE; E. W. Stull, Milwaukee, Wis. App. filed Aug. 22, 1908. For railway motors with commutating poles.